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MILK FEVER OR HYPOCALCÆMIA OF PARTURIENT COWS*

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READING.

So many theories have been advanced with the idea of explaining the nature of this disease that it has been called the "disease of theories"; unfortunately these theories have never, until recently, had any experimental evidence to support them: a number have been shown to be incorrect.

In 1897 Schmidt, a Danish veterinarian, examined microscopically the milk from cases of milk fever and came to the conclusion that a toxin or ferment in the udder was responsible for the disease. He evolved the injection treatment which, I believe, consisted of:—

Pot. Iodide	... ...	Grs. 150.
Tr. Iodine B.P.	...	M. 60.
Water ad.	... ...	Oz. 32.

A quarter of this solution was injected into each quarter of the udder, the udder was then massaged. Nowadays it is thought necessary when inflating the udder to inflate thoroughly. I should like the opinion of members as to whether it is necessary to do this or not. Eight ounces does not fill a cow's quarter. The number of recoveries was considerably increased from this method of treatment; instead of about 70 per cent. of cases dying, 85 per cent. recovered.

It was later shown that Schmidt's assumption was wrong, that what he took for degenerated cells were normal elements and were present in the colostrom of all cows; fortunately he had not controlled his work by the examination of milk from normal cows, for if he had done so his udder treatment would probably never have been tried.

At the time of this discovery I happened to be a pupil to a veterinary surgeon and it was this probably made me take a great interest in the disease for the rest of my life. Whilst on active service, I got interested in the work of Macallum and Voegtlin and others on the condition of tetany produced in dogs after parathyroidectomy and formed the opinion that milk fever in cows was a very similar condition to the tetany produced in these dogs; this opinion was strengthened by the knowledge that in the tetanised dogs the blood Ca was very low and the symptoms could be relieved by the intravenous injection of Ca salts; also, that Ca was a most important element to the parturient and lactating cow and that pastures were very often deficient in this element.

It was not until 1924 that I was able to persuade a chemist to undertake blood analyses for me and was fortunate in getting Dr. N. C. Wright interested; he was very soon able to demonstrate that in milk fever the blood Ca was deficient to as much as 50 per cent. and that the more severe the case the lower was the blood Ca, also that on recovery the blood Ca had once more risen to normal.

This has been confirmed by other workers, notably by Dryerre and Greig, Hayden and Fish, and Sjollema. The cause of this hypocalcæmia is still debatable. It seems extraordinary that veterinarians have not until recently recognised that milk fever is primarily a tetany. The movements of a cow in the early stages of the disease before "going down" are those one would expect from tetanised muscles and when down the muscles of the limbs are in such a state that often it is impossible to bend the knees and hocks, yet suddenly the patient will do this herself.

The assimilation of Ca by the animal body is a very complicated process and the following factors all exert their influence:—

1. The amount of Ca in the food.
2. The presence in the food of a sufficient amount of vitamin D.
3. Sunlight.
4. The mineral content of a diet should be properly balanced.
5. The parathyroid glands.

1. The Amount of Ca in the Food.

The amount of Ca required by a lactating and pregnant cow is very great; it has been stated to be as high as 4-oz. of Ca-O per day and may be even higher. It is said that 7/9ths of the lime present in a calf at birth has been deposited in its body during the last 60 days in the uterus.

I should like to hear members' experiences of cows eating bones: I had a case of a farmer whose cows did so. It is a common thing in South Africa, but there, I believe, the deficiency is phosphorus. At Reading the soil is deficient in lime: there is one farm where they have a number of cases of milk fever, and I suggested they should lime the pastures. The lime had been put into small heaps and left there, and one day, when the cows were turned out, I saw one cow eating this lime, which, fortunately,

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had been slaked by the rain. That cow has not since had milk fever, and I think the lime did some good.

It is also estimated that a cow weighing 1,200-lbs. would deplete her blood of Ca, were there no reserves to fall back upon, by producing half-a-gallon of colostrom, so that when three gallons of colostrom are produced in one day the blood has to have its Ca content replenished six times during that day.

This all goes to show how important it is for a parturient cow to have a sufficient reserve of Ca in her system and that the drain upon her at the time of parturition is not only great but sudden. In this country a large number of animals are fed from the time of weaning upon a diet which contains barely sufficient lime for their needs; this it not remarkable when one considers that on some untreated pastures the herbage contains only 5½-lbs. of lime per acre and that this amount can be increased to 112½-lbs. per acre by liming the land.

Heifers are often put to the bull before being fully grown; they therefore require lime for their own skeleton, beside that for their calf and after calving for the milk produced.

2. Vitamins in food.

During the summer months when at grass animals get, probably, all the vitamins they require; it is during the winter months that their supply of these necessary food factors is perhaps deficient.

Cabbage, kale, kohl rabi, swedes and well-saved hay all contain a good quantity.

Mangolds, badly saved hay, straw and concentrated foods are deficient.

3. Sunlight.

Sunlight acts not only on the animal body, but also determines the vitamin content of the different foodstuffs. In this country we are not overblessed with sunlight and it is the practice of some dairy farmers to keep their cows housed during the winter months, the sheds very often being badly lighted; so that during the winter these animals get little or no benefit from direct sunlight and if we have a dull summer such as the last the effect upon the animals must be bad. It is during the winter months that the amount of vitamin-containing foods becomes short and these foods depend upon direct sunlight during their growth for their supply of vitamins.

Some interesting work has been done at the Research Institute at Shinfield. With regard to the growth of rats which were fed on butter produced from the cows at the Institute during summer and winter, and also from the milk of cows which had had cod-liver oil in their ration, it was found that the rats grew better in the summer than in the winter, and those fed on butter from the cows on cod-liver oil grew better than the controls.

4. The Balance of Minerals in the Food.

Under this heading the most important is the Ca-P ratio. It is stated that an excess of phosphates in a diet interferes with the Ca assimilation and an animal in a state of latent tetany will go into tetany if given phosphates.

In this country the diet of most cows is rich in phosphorus. Superphosphate manures are largely used—grasses, mangolds, most cereals and cakes are all rich in phosphorus.

MINERAL BALANCE SHEET

Daily Amounts in Ounces.

For Maintenance and Production of 3 gallons Milk

		CaO	P_2O_5	Na Cl
Income (3 gallons).				
Maintenance ration	30-lb. mangolds 14-lb. seeds hay 7-lb. oat straw	3·6	1·1	1·3
Production ration	10½-lb. concentrates	0·4	2·2	0·1
	Totals	4·0	3·3	1·4
Expenditure (3 gallons).				
Maintenance		1·5	0·8	2·9
Production		0·8	1·0	1·1
Add for Ca and P (50 per cent. assimilation)		0·8	1·0	—
	Totals	3·1	2·8	4·0
Balances		0·9*	0·5*	2·6**

For Maintenance and Production of 5 gallons Milk

Income (5 gallons)	4·2	4·8	1·5
Expenditure (5 gallons) ...	4·2	4·0	4·9
Balances	nil	0·8*	3·4**

Note.—Seeds hay is richer in lime than most other varieties.

* = Surplus. ** = Deficit.

There is good reason to believe that often the phosphorus content is high and the calcium low.

The following cases support this assumption:—

(*a*) On two adjoining farms, one owner used superphosphate manure heavily and had a large number of cases of milk fever every year; his neighbour who did not use superphosphate had very few cases.

(*b*) The farmer noticed that when his dry cows were grazed upon a certain meadow they nearly always developed milk fever after calving, while when grazed on other land they did not do so so frequently. An analysis of the herbage of the suspected meadow taken during June showed 0·933 per cent. of lime and 0·550 per cent. of phosphorus; the percentage of lime is about normal but that of the P. is high.

(*c*) On another farm the land of which is deficient in lime, the cows were fed rather liberally with fish meal (1-lb. of fish meal to 3-lbs. of concentrates) and mangolds in their ration; the serum Ca of the cows under normal conditions was low and a large number of cases of milk fever occurred: after the fish meal was stopped the milk fever cases were reduced to almost nil and the serum Ca of the cows under ordinary conditions was found to be normal.

With regard to the balance of minerals, it is important that the potassium and sodium ratio should be correct. The amount of chlorine in the diet must be sufficient. It is stated that magnesium in the diet, if in excess at all, interferes with assimilation of Ca. Phosphates also must not be in excess. You must have the proper balance.

3. The Parathyroid Glands.

Disease or removal of these glands causes an animal's blood to become deficient in Ca, the animal passing into tetany, which can be relieved by the intravenous or oral administration of Ca salts; this relief is only temporary.

It was suggested recently that milk fever might be due to some disease of these glands, but really I cannot believe it.

It is difficult to believe that disease of these glands could be the cause of milk fever; if it was the case, we should expect to have more cases of the disease at other times during lactation, and recovery would not be so quick or complete. I suggest that it is this sudden demand of the animal at the time of calving for a large quantity of Ca, when her readily available reserves of this element are low, that precipitates an attack of milk fever.

It is unusual for a cow to be attacked with milk fever until her third calving and it is her treatment and milk and calf production during her time in the dairy which cause the lime reserves of her body to be depleted.

It seems to be an established fact that anything which will cause a heavy flow of milk at the time of calving predisposes to milk fever and anything which will tend to restrict the production of milk is a deterrent.

What is required is something which will carry the cow over the first two or three days after calving and allow her metabolism to settle down to the changed conditions. Some of you may be able to say it is better to have a cow in a fat condition to calve down, and others may say it is better for her to be thin.

TREATMENT

With regard to diet, it is well known that plants of the clover family are generally rich in lime, and it is surprising the number of farms where the pastures contain few plants of the clover family. Lucerne is one of the richest in lime and vitamin D, and should be grown more and used more for cattle-rearing and dairy cows.

Schmidt's treatment has been improved upon and the treatment now in general use is inflation of the udder with air or oxygen. The udder is fully inflated and sometimes the teats are sealed by tapes or bougies to prevent escape of the gas.

It is debatable how much of the success of this form of treatment is due to the actual treatment and how much is due to the fact that less medicine is given orally; a large number of deaths from this disease were brought about, previous to the inflation treatment, by injudicious drenching.

It has been shown by Dryerre and Greig, and others, that inflation of the udder causes a gradual rise in the blood Ca which persists for a few days, the peak of the rise being gained about 36 hours after inflation; this will account for the fact that animals which recover after inflation seldom relapse.

The Injection of Ca Salts.

The gluconate, lactate and chloride of Ca have all been used for this purpose; another salt, the levulinate, is, I believe, being prepared. They are usually used in 5 or 10 per cent. solutions with or without glucose.

The lactate can be given intravenously, intramuscularly or subcutaneously without any harmful effects. The gluconate can be given intravenously or intramuscularly without causing any harm, but if given subcutaneously in any large quantities will occasionally cause some induration which is not of any great consequence, but is not liked by the owners of animals. The chloride can only be given in sufficient quantities intravenously, as when given subcutaneously or even intramuscularly in sufficient quantities sloughing of the tissues is caused.

Undoubtedly the best method of treatment is the intravenous one and I prefer to use the chloride for this purpose; the result is generally quite spectacular: an animal in a state of coma will begin to improve during the injection and be drinking water within ten minutes and very often be on its feet before you have left the premises. It is not always easy to give a case of milk fever an intravenous injection, especially if the cow is tottering about on her feet, but when down, with a good light and two helpers it can generally be done without much trouble; if the cow is comatose it is easy—under these conditions I have performed the operation alone.

My method of performing this is to have one man to steady the cow's head by her horns, a cord is placed around the neck to raise the jugular vein and held by another assistant, the skin over the vein is sterilised with tincture of iodine and a large bore needle with a butt to

fit a 50 c.c. syringe is then pushed into the vein, pointing towards the head; when in the vein there should be a good stream of blood flowing out of it. The cord is then relaxed and the syringe previously filled with the solution is fitted to the needle; to make sure the needle is still in the vein, I draw a little blood into the syringe—if in the vein, the blood will flow into the syringe easily. The solution is then forced into the vein against the blood stream as slowly as possible.

When the injection is completed draw a little blood into the syringe and withdraw the needle. I inject from 100 c.c.-250 c.c. according to the size of the cow and severity of the case; it is seldom necessary to use more than 200 c.c. of a 10 per cent. solution.

During the past eight years I have been using this treatment and have only had trouble with one case of milk fever and one experimental animal. In each case a little of the solution escaped under the skin and caused some swelling which in time subsided without any treatment.

It is most important to inject the solution slowly; a continuous slow stream should be aimed at and by using a 50 c.c. syringe there is the advantage of allowing a few seconds to refill it. As my clients are all conversant with the inflation treatment and some even do this themselves, I generally inflate the udder slightly after giving the injection; this certainly has its advantage, for it has been shown that when Ca salts are injected into the blood stream of healthy animals they do not remain there for long, being taken up very quickly by the skeleton and tissue spaces, and probably in milk fever a large proportion of the injection is used up in the same manner and the height of the rise of blood Ca due to inflation is not reached for 36 hours.

The injection relieves the cow almost immediately and the inflation should prevent any relapse. It is being much more generally admitted that there are very often cases encountered which do not respond to inflation of the udder alone—these cases nearly all recover when given Ca salts intravenously.

Prevention.

We must try and prevent milk fever. It has always been to me a disgrace, and up to a few years ago we did not even know what caused it. No-one seemed to worry about it.

It has been found that at the time of calving a cow's blood Ca has a decided drop; dry cows have an average blood Ca of 11 m.g. per cent.; at the time of calving it is 8·5 m.g. per cent., and two or three days after it rises to 9·5 m.g. per cent. and remains fairly constant during lactation.

It was thought that if it was possible to prevent this drop it might show a way to prevent milk fever. The following methods were tried:—

1. Dosing with Ca salts before and after calving.
2. The injection of parathyroid extract at intervals up to calving.
3. Irradiation with ultra violet light previous to calving.
4. Feeding cod-liver oil for some weeks before calving.
5. Feeding cod-liver oil and calcium salts before calving.

The best results were obtained by feeding cod-liver oil and Ca salts.

The subcutaneous injection of Ca salts just after calving may ward off an attack of milk fever. Undoubtedly the best way to prevent milk fever is to make sure that all animals which are to be kept for the dairy receive foods, which contain a sufficient quantity of lime, from the time of weaning onwards—to do so just a few weeks or months before calving is not sufficient.

The proper liming of pastures is most important; this ensures a growth of herbage which has a high lime content.

The giving of parathyroid extracts, irradiated ergosterol or cod-liver oil is not at present recommended as a curative or prophylactic unless Ca salts are given at the same time, for although they may relieve the symptoms or ward off an attack they do so at the expense of the Ca reserves of the skeleton and would perhaps render the animal more liable to a future attack. It is better to rely upon the injection of Ca salts or the feeding of chalk.

Post-mortem appearances.

Very little has been written upon this aspect of the subject probably because now deaths are few and mostly are due to septic pneumonia or some other complication and not to milk fever proper.

In cases which die, and especially if tetany has been severe, changes can be found in the muscles of the limbs, neck and/or back. Sometimes large areas of muscle are affected. The muscle fibres show degenerative changes: there is a dry necrosis with blood extravasation between the fibres, some of which are swollen, some are ruptured and others have lost their normal striation. This condition was first mentioned in 1922 by Thos. Wilson, who described it as gangrene of the gastrocnemius. The kidneys and bladder often show small hæmorrhages, the urine in some bad cases is often found to contain red cells.

These analyses have all been done for me by the workers at the National Institute for Research in Dairying, and the late Dr. R. S. Williams was a great help, and also Captain Golding. I owe a great deal to them for their help and kindness.

Discussion

Opening the discussion on Captain Little's paper, Major A. C. Duncan said he had no desire to rush in where angels feared to tread. He dared not dogmatise on the subject of milk fever, and it was just possible that the views of Captain Little on that subject might be correct. But, like the late Lord Balfour, he was filled with philosophic doubts. So far as the etiology of milk fever was concerned, Captain Little had stated that it was a disease of theories, and he rather gathered that the essayist suggested the theories had passed away, and they were now in possession of proven facts. For his (Major Duncan's) part the hypocalcæmia theory had left him in a greater fog than ever. It seemed to him to be rather a matter of evidence, because however strong some of the links of evidence might be, if there were links missing, the whole case must for the time at least be regarded as not proven.

It would be interesting to consider the position of Schmidt in relation to milk fever. Up to the time of his discovery, as Captain Little had told them, there were 70 per cent. of deaths. Then he elaborated a theory, erroneous, if one liked, that the disease was due to some toxic substance in the udder, and used an injection of some material which he deemed would destroy that substance. Thereafter by the use of this method 85 per cent. of recoveries were recorded. Surely he was justified in saying "I told you so" and "the proof of the pudding is in the eating." No doubt he was wrong, but the evidence he produced was very convincing.

Chinosol was used for the same purpose with like effect, then it was discovered, probably accidentally, that inflation of the udder with oxygen, or even air, was followed by similar recoveries.

So from 1897 for about 30 years one of these methods of treatment was adopted with signal success. During that time most of them were convinced that the real etiology of the disease was still unknown, but practised the methods because satisfied that success attended them.

Now, just as Professor Einstein had given them a new vision of the physical universe, replacing the laws of Newton, so Captain Little, Greig, Dryerre and others had given them a new theory and treatment for milk fever. The treatment, like its predecessor, was successful, perhaps even more so, as probably all had seen recoveries following the injection of calcium gluconate which were spectacular. Still, there were, he thought, a few which succumbed even with the injection of calcium gluconate. None the less, he for one had little fault to find with the treatment, except perhaps that it was a little cumbersome. He confessed that he usually adopted the older method first, and the majority recovered. If they did not, he then fell back on calcium. Where he thought the evidence was incomplete was in the definite conclusion that the cause of milk fever was calcium deficiency. He desired to make it plain that he neither disputed nor in the least belittled the work Captain Little, Greig and others had done, but at the same time Captain Little was a scientific observer and was naturally searching for the truth. If he found some part of his work which was not true he (Major Duncan) was sure he would be quite content to go back to the last point on which he was sure, and start again.

He had shown, and others also, that during the course of milk fever there were profound changes in the chemical contents of the blood, mainly in blood calcium and also in other respects. He would like Captain Little to give them a much clearer explanation of those changes, because so far, to him, the explanations had been extremely vague. If he dared to criticise the paper, he would say that Captain Little had made a passing and vague reference to what he (Major Duncan) took to be the real causes of the disease and passed on to suggest what he gathered to be not the cause.

He had implied that the amount of calcium in the food was deficient, had given the amount which a cow required, and had stated that by liming the pastures, the calcium content had been raised from 5½ lbs. per acre to 112½ lbs. per acre. There was also an incidental remark to the effect that heifers were often put to the bull before fully grown and required all the calcium they could get for their own skeleton, not to mention the calf and milk.

If that, then, was the cause of milk fever, they should expect a vast number of heifers, from two to three years old to develop the disease; yet as Greig said, the disease rarely occurred in the primaparæ. Moreover, if a deficiency of calcium was the cause one could understand that the addition of that substance, by injection or otherwise, might cause the symptoms to abate, but not when mere udder inflation was practised. It was too late to suggest that the success of udder inflation was due to the withholding of medicines, as it was shown that that, too, caused a rise in blood calcium, although no calcium had been added from without. It had been his custom to milk off a cow before injecting air, thus robbing her of still more calcium, but by the mercy of Providence the cow had recovered all the same.

That was all rather bewildering, and the evidence appeared to be conflicting. Captain Little had produced one or two cases to show that feeding on pastures to which lime had been added had reduced the incidence of the disease, but on the other hand, one could produce a large amount of evidence to show that taking the cows off the pastures for three or four weeks before calving, and feeding them intensively on concentrates having a lower calcium ratio than pasture would also reduce the incidence of the disease to almost vanishing point. Besides, milk fever frequently occurred in districts where lime was super-abundant, as in his own district. Unfortunately, they had not been able to ascertain the total amount of calcium in a cow's body before and during an attack of milk fever. There seemed to be no evidence that there was a general lack of that substance in the body. Such evidence as was available seemed to suggest a few tentative conclusions:—

(1) That feeding had some effect on the disease; exactly what, he did not know.

(2) That the event of parturition had also some effect; again, he did not know why (it was of little use to suggest the removal of the calf from the body had so deprived the mother of calcium as to produce the condition, as there were many thousands of calves born in exactly the same way, and milk fever did not follow; on the other hand, there was no evidence at all to show there was a diminution in the total amount of calcium in the body).

(3) That these influences were in some way connected with a derangement of mineral metabolism, whereby both the calcium and the phosphorus contents of the blood were altered.

(4) The evidence, so far as it went, did not prove that lack of calcium was the cause, or in fact that there was any such lack.

As Captain Little had suggested, milk fever was only one of several diseases which were associated with exactly similar changes in the

blood. Chilblains in man were associated with reduced blood calcium content. His contention was that, although the work of Captain Little and others had given them a definite step forward in their knowledge of milk fever, yet the real cause was still unknown, and many of the views at present expressed were like many of the old ones—mere speculation. He believed that Captain Little started on the right road when he made his first observations on the effect of parathyroidectomy in the dog. That was one of a series of apparently isolated facts which seemed to be concerned with the problem before them. Some of them had been alluded to by Captain Little in his paper as factors concerned with calcium assimilation (Major Duncan was of the opinion that the wrong word was used here);

(1) The hormone of the parathyroid gland controlled the calcium content of the blood plasma.

(2) Vitamin D was concerned with the control of the balance of calcium and phosphorus in the animal body (how it performed that function was unknown).

(3) Ionisation with gamma rays had an effect on calcium metabolism (at one time it was thought that those rays of the ultra-violet series were complementary to vitamin D, but now it had been shown that the vitamin could be formed from ergosterol by irradiation with gamma rays).

It was interesting to note there was a seasonal variation in the vitamin A value of dairy produce, and possibly of other vitamins, and that reflected the seasonal changes in the feeding of farm stock, and most country practitioners had noted similar variations in the incidence of milk fever. Another observation recently made in the Hannah Institute was that the injection of certain nitrogenous substances had an effect on the lowering of the blood calcium. He could not help thinking that it was only when those facts were co-ordinated, as the pieces of a jig-saw puzzle were fitted together, that the true picture would become visible.

Captain J. A Craft suggested that had he been in the position of Captain Little for the past few years, but investigating on a bacterial basis, he thought the results would have been nearer the mark, if not on the mark. He was speaking as one of the older practitioners who still stuck to the old-fashioned idea that milk fever was due to a specific organism, and not to a calcium deficiency. Milk fever was found in almost any milk cattle. It was more prevalent in some breeds than others. It was found present in the cow that was due to calve, in the cow that was about to calve, and in the cow that had calved, and in every stage of lactation. That week he had had a cow that had calved three weeks and went down with milk fever, and in the same herd a cow had been calved nine months, had almost dried off, was due in July to calve, and she went down with the disease. If the fever was due to a calcium deficiency, he thought it was up to Captain Little to dispel their minds of any doubt. He had noticed all his life that it was not only amongst the heavy milkers that they experienced the fever, but they would hear it said on all sides that it was. How many cows did they see where the animals were giving up to 2, 2½ and 3 gallons where they had had various symptoms which were none other than milk fever and responded immediately to the inflation treatment. That could not be put down to a calcium deficiency, because where could they get it in a cow which was giving only 2 to 2½ gallons a day? Had anyone ever seen a 5, 6, 7, 8, or 9-gallon milker go down with milk fever giving her full quantity of milk? In his experience the cow which was infected did not give her milk down fully—invariably, the quantity given was less than one-quarter the normal amount, and very occasionally, one saw a cow give a fair quantity which went down about the third day after calvng. Where did calcium deficiency come in there? Captain Little spoke of Epsom salts as a poison in the case of milk fever. Immediately a cow had recovered sufficiently to have a drink, he (Mr. Craft) always gave her a small dose of Epsom salts, and repeated it every 24 hours until the third day. He knew it was going against the calcium principle, because it certainly did tend to reduce the calcium in the system. If one man found it successful, he could not see how it could be said to be poison. With regard to the cause of milk fever, everything (to his mind) was dead against the calcium theory and, on the other hand, he maintained that everything pointed to udder infection. If cows were dried off, they got milk fever—if allowed access to buildings—but if they were kept away from all buildings for at least four weeks prior to calving and kept in the fields in which they had calved for three days after parturition there would not be one per cent. of susceptible cows that would develop it.

In inflating the udder one had in a crude way uppermost in one's mind oxidation and neutralisation of toxins formed and the suspension of further formation.

Major G. W. Dunkin said he knew little about the theories of the causes of milk fever, and he hoped in what he was going to say that he would not be misunderstood. His intention was to seek for information, and not to criticise. He was to some extent in agreement with what Major Duncan had said. With regard to the paper, he regretted to see such expressions as "it was later shown," "it is said," "it is also established." He was sure these were correct, but he suggested that some of them would like to know the authors of those remarks so that they could look up the original papers, and see what grounds they had for arriving at the conclusions. He was astonished at the remark, "It seems extraordinary that veterinarians have not until recently recognised that milk fever is primarily a tetany." He did not think that was fair, and he could not agree that it was only recently that clinicians had recognised it. Again "In this country a large number of animals are fed from the time of weaning upon a diet which contains barely sufficient lime for their needs." He supposed that was accurate, but it would be interesting to know exactly what diet Captain Little referred to, and if he had any information which went to show that such animals were shown to be subject to milk fever. With regard to vitamins in the food, Captain Little mentioned cabbage, kale, kohl rabi, swedes and well-saved hay. That was quite correct, but again he thought some of them would like to know what vitamins Captain Little considered essential in the diet for the prevention of milk fever, and he had omitted carrots, which had been proved to have a very high vitamin content.

Captain J. R. Hewer said if milk fever was due to a calcium deficiency, why did they seldom get it in heifers? Surely growing heifers required a lot of calcium for themselves and calf, and yet they seldom found a heifer or a second calver down with milk fever. He gathered it was a deficiency disease. At one of his farms—a hill farm on chalk—the farmer started feeding his cows scientifically. Up to then he got no milk fever, but since he had been using balanced rations and cutting down the hay he had been experiencing the disease among his animals. Why was it they got it in

cows after easy cases of calving, and seldom got it in cases where calving was difficult, and in cases where the constitution was low? A few years ago they got milk fever after flushes of grass, more particularly in August, when the weather was warm: they were getting sunlight, and eating lush grass, which should be full of vitamins and consequently of assistance in calcium assimilation. Since cows were fed on balanced rations they got milk fever all the year round. It was now not uncommon to get a case on Christmas Day or about that time. How did Captain Little's theory agree in the case where the cow was eating bones? The cows were proven to have a lack of calcium, and yet the cases of milk fever were only 15 per cent. Had breed any influence on the disease? Captain Little also suggested inflating the udder as well as giving calcium. Supposing cases were found where cows did not respond to udder inflation, was it then too late to give calcium?

Colonel Greenfield said that, with regard to it being suggested that the cause was a calcium deficiency, his experience—that of a much-travelled man—was that wherever he had seen cows and cattle in China, India, Burma, or the West Indies—places where there was a vital deficiency of calcium—they rarely had any cases of milk fever or had never heard of it.

He asked if Captain Little had any definite observations upon the systematic use of good mineral mixtures and cattle licks amongst dairy herds with a view to its effect on the incidence of milk fever. If the disease was a calcium deficiency the regular use of mineral feeding should give decisive results in prevention.

Mr. J. Bell said that personally he belonged to the old class of "windjammers." He had used calcium injection, but could not say that he had found any advantage over the old treatment. Clients—and he was sure it was the same with other veterinary surgeons' clients—when they saw fatal cases—which, unfortunately, did sometimes occur—were inclined to say that they wished he had used the old treatment, and for that reason he was disposed to keep to it. Captain Little had endeavoured to prove to them that milk fever was due to a hypocalcæmia. There were diseases in other species of animals where they found this condition and they did not appear to have any connection with milk fever, and for that reason they should not be too quick to jump to the conclusion that milk fever was due to a calcium deficiency.

Captain Hewer asked what position they would be in—if they used calcium only and the cow died—in the Law Courts, supposing they were sued?

Major Duncan replied they would be just where they were, because they had adopted a perfectly rational, ordinary treatment, and if the cow died it would be by the Divine will. (Laughter). In any case the client would have to prove negligence.

Summing up, the President (Major F. J. Taylor) said he had not heard anyone describe the first symptoms of milk fever. He always considered the first symptom was a slight paddling movement of the hind feet. With regard to cows receiving benefit from being in artificial sunlight, there were many advertised methods of providing so-called sunshine rays, and he had yet to be convinced whether there was any virtue in this method of lighting. He was still extremely puzzled why heifers and second calvers seldom got milk fever, and why third calvers usually went down on the third day after calving. He usually adopted the method of milking a cow clean out before giving an inflation, and he never tied the teats. The real value of inflation, to his mind, was to produce pressure, and prevent the toxin from reaching the general nerve and blood supply by constricting the lacteals. He agreed with Captain Little that very often cows were killed by injudicious drenching during a state of coma. He thought the essayist had put up a very strong case indeed from his point of view, but he regretfully came to the conclusion that it was weakened by his confession that he afterwards inflated the udder. He would reply to that, possibly, by saying he did it "to satisfy his client," but on the other hand he probably also had in mind a "safety first" precaution. Intravenous injection of a large quantity of fluid into a vein seemed a rather complicated process, especially in the field, at night, etc.

THE REPLY

Replying to the discussion, Captain Little said that with regard to the first symptoms of milk fever, it was easy to recognise the paddling of the legs as the sign of tetany coming on—the muscles were beginning to become tetanised. Tetany came on gradually—they were not speaking of tetanus. He could not say whether any benefit was derived from "windowlite," but if violet rays were admitted it must be of advantage. They knew that the more windows there were in a cowshed the better it was for the animals. Dealing with the full inflation of the udder, he did not know whether there was any advantage in doing that, or whether it was wise to tie the teats. Personally, he did not think it was necessary. A mark was left on the teats, and if they were tied too long a swelling was caused.

Major Duncan, in his opinion, was the ideal person to open the discussion. He was sure the way the discussion had been carried on was largely due to the way in which Major Duncan opened it. (Applause.) He desired to say that throughout the whole of his work and in papers which he had written on that subject, it had never been his idea to perfect any form of treatment or to improve upon any form. As he said when reading his paper, it was extraordinary that there was a disease they could see so often, could treat and cure so easily, and yet did not know what caused it.

The reason he always gave an intravenous injection was that one nearly always got an immediate response. With udder inflation the rise in the blood calcium did not reach its peak until 36 hours afterwards. The reason he inflated the udder as well as gave an injection was that if the udder was not inflated in addition one could not be certain whether an animal was going to be bad again in a very short time, because the injected lime was snapped up from the blood stream by the skeleton and tissues and the animal was back where she was. Major Duncan spoke about blood changes, but did not specifically mention any change, and he did not know whether Major Duncan was referring to phosphorus. Personally, he left the phosphorus out, because it was found to be also low. Fish, the American veterinarian, who was now dead, showed that phosphorus was down in the majority of cases, and he said that, on recovering, a cow's blood phosphorus went up before calcium. On the face of it, that seemed important, but Fish, like others, referred to total calcium—there was diffusible and non-diffusible, and tetany was said to be due to loss of the diffusible, and as long as the diffusible calcium was high they would not get tetany.

With regard to heifers, he asked them not to

believe that heifers did not get milk fever; they did, but it was rare, he admitted. The same thing applied to calves. Speaking of the reserves of calcium, Captain Little said an animal, from the time it was born, started laying in a store of calcium for future uses. That was one of the things the skeleton was for, and a heifer calf started storing calcium while still taking milk. When a heifer was in calf, therefore, she might have barely enough, and that was when the reserves began to get short, and once she began to lactate she was using up her reserves. With regard to the skeleton and the reserves of lime, he said there was an interesting piece of work awaiting some energetic young man. The next time a young man should have an animal die from milk fever he should collect the bones, and get someone to analyse the calcium content in them. With regard to light milkers and heavy milkers which had fever, had they milk records of cows which were supposed to be light milkers? Very often supposed light yielding cows were the ones which gave the most because they were more consistent in their yield per day. Major Duncan spoke about farms on chalk. Just because grass was grown over chalk, that did not say it was getting much calcium.

Replying to Captain Craft, Captain Little said that in tetany sub-normal temperatures were experienced, and with convulsions perhaps high temperatures. If the disease was bacterial, surely they would always get high temperatures? Again, the recovery could not be so complete, and if there was any toxin in the udder of the cow it must come out in the milk, and he had never known anyone to suffer any ill-effects after drinking the milk. Dealing with breeds, he said it had been pointed out that Jerseys were susceptible to the fever and their milk had a high fat content, but Friesians were the reverse. Captain Craft mentioned an animal which had fever three weeks after calving. They got hypocalcæmia in animals during all stages of lactation, and did not always realise it. Captain Craft also spoke of an interesting case in a cow drying off, and that was rather exceptional. He did not remember having anything in a dry cow that he would have thought was milk fever. That was somewhat difficult to explain, but he knew that in dry cows the blood calcium was at its height. Then there was the remark Captain Craft made about turning cows out to grass to prevent milk fever. It was not altogether the exercise they got, although there was no doubt they benefited by it, but they were getting grass which contained vitamins and they also got sunlight—two things which would help. Captain Craft also spoke of feeding calcium phosphate, but he (Captain Little) was very much against the feeding of that to cows which were being fed with a fair amount of concentrated foods. He thought the good obtained from the calcium was negatived by the presence of excess phosphorus. If they got milk fever in a cow giving only 2½ gallons a day, he thought she must have been fed very badly and treated badly previous to her calving. He still thought it was the heavy milking cows which were most liable to milk fever.

Replying to Major Dunkin, Captain Little said the reason references were not included in the paper was because he had not time to put them in. His idea was to set up a discussion so that he might learn something. There was also some mention of animals having sufficient lime for their needs and the diet they should have. The animal which was carrying a calf and milking at the same time certainly did not get sufficient lime, and that was particularly so where the pastures were deficient in lime. The chief vitamin was D, the calcifying vitamin. But like minerals, vitamins depended one on the other, and he thought they must all be present and in sufficient quantities. Major Dunkin said he never mentioned carrots, but he remembered reading the Medical Research Council's report upon vitamins a year or two ago, and if he remembered correctly, under carrots they either expressed no opinion or said they did not contain such a large vitamin content. A lot of work had been done with carrots, and it might be they did contain vitamins; in any case it had been proved they were useful to horses.

Commenting on the discussion relating to balanced rations, Captain Little said that if a cow was fed on balanced rations she would give more milk, and if she gave more milk she was more likely to have milk fever. Concentrated foods contained large quantities of phosphates. What they wanted in addition was powdered chalk and raw salt, and plenty of it, given in with their feed. Colonel Greenfield said milk fever was not prevalent in certain other parts of the world, but perhaps so many of the cows abroad did not give sufficient milk to get the fever. In India, he has been told, milk fever was fairly common.

REGISTERED DAIRY CATTLE

Particulars of 514 cows in respect of which Certificates of Merit have been awarded by the Ministry of Agriculture since October 1st, 1931, are contained in Volume XV of the Register of Dairy Cattle, which has lately been issued. This compares with 288 cows entered in the previous Volume. For a cow to be eligible for a Certificate of Merit it must normally have calved not less than three times during a period of three consecutive Milk Recording Years and have given, during those years, not less than the prescribed yield of milk, which for the three years ended October 1st, 1931, was 30,000 lb. for Friesians; 27,000 lb. for Ayrshires, Blue Albions, Lincoln Red Shorthorns, Red Polls, and Shorthorns; 24,000 lb. for all other breeds or types except Dexters; and 21,000 lb. for Dexters.

A statement is given showing the number and distribution of the yields of the cows of the various breeds entered in the Register, and the highest yield certified for each breed for the three years ended October 1st, 1931. Of these cows three gave over 50,000 lb. of milk during the three years concerned; 29 over 40,000 and under 50,000 lb.; 59 over 35,000 and under 40,000 lb.; 181 between 30,000 and 35,000 lb.; 141 between 27,000 and 30,000 lb.; and 52 between 24,000 and 27,000 lb.

Particulars are also given of pedigree bulls of proved milking strain. The condition of entry of a bull in the Register is either (*a*) that its dam and sire's dam have given the standard yield prescribed for their breed or type in any particular Milk Recording Year, or (*b*) that it has two or more daughters that have given not less than the standard yield prescribed for their breed or type in any particular Milk Recording Year. Entries relating to 20 bulls are given in the Volume, 9 of which qualified under condition (*a*) and 11 under condition (*b*).

A list of the Milk Recording Societies in England and Wales, with particulars of each Society and the name and address of its Secretary, is included in the Register, which can be obtained (price 9d.) from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, or through any bookseller.

BLOOD GROUPING IN MAN AND ANIMALS WITH SPECIAL REFERENCE TO ITS OCCURRENCE IN THE EQUINE

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It was in the years 1900 and 1901 that Landsteiner[18A & 18B] made his remarkable discovery concerning the peculiar behaviour of red blood cells and serum. He observed that the admixture of human cells and serum from different individuals frequently resulted in the collection of these cells into clumps. This phenomenon of clumping was not in itself a new thing; it was known to occur when red blood cells and serum from different species of animals, *i.e.*, "heterologous" species, were mingled, but it had never previously been noted within a species.

The term "iso-agglutination" was applied to this particular type of reaction. Landsteiner examined the blood of 22 human beings and found that the reaction did not occur haphazardly, but that, on the contrary, it behaved very characteristically. It followed certain definite rules which enabled the bloods to be collected into three groups.

To explain these results Landsteiner put forward the following hypothesis, namely, that in the serum there were two specific iso-agglutinins and in the erythrocytes two corresponding iso-agglutinogens. It was not possible for an iso-agglutinogen and its corresponding iso-agglutinin to appear together in the same blood. Agglutinins could appear singly or together and the agglutinogens could also appear singly or not occur at all. There was no case where both agglutinogens were present and both agglutinins absent.

In 1902 von Descatello and Sturli[5] discovered this fourth group in which both agglutinogens were present and both agglutinogens absent. The relatively small number of persons who fell into this group rendered its demonstration difficult and it was only by the examination of a comparatively large number of bloods that its presence was detected.

CLASSIFICATION OF GROUPS

(*a*) Main Groups.

The three groups of Landsteiner and the fourth of von Descatello and Sturli were confirmed by Hektoen[13] in 1907. Jansky[16] in the same year was the first to attempt a definite classification. His classification is as follows.

Cells.	Sera. Group I.		Group II.		Group III.		Group IV.	
Group I	...	−	...	−	...	−	...	−
Group II	...	+	...	−	...	+	...	−
Group III	...	+	...	+	...	−	...	−
Group IV	...	+	...	+	...	+	...	−

Moss[24] brought forward a classification similar to the above, except for the interchange of groups I and IV.

A new terminology based on the agglutinophyllic capacity of the cells has recently come to the fore. Jansky's group I containing no agglutinogens is known as group O, group II as group A, group III as group B and group IV as group AB. This latter classification will be used throughout this paper.

(*b*) Sub-Groups.

In man the majority of reactions obtained from the admixture of serum and erythrocytes fall into the four main groups, but there is a certain proportion which cannot be classed in this way. Certain of these reactions may be explained by errors in technique, psuedo-agglutination, etc., but what is meant here is that type of reaction that is quite distinct from these causes, a type of reaction that is held to be due to specific factors, similar to those which are responsible for the main groups. This class of reaction forms the so-called sub-groups.

They are not a new discovery—Landsteiner himself noted them and since then many workers have come across them. There is still considerable diversity of opinion as to whether these anomalous reactions are specific or non-specific.

Hitherto the technique employed in typing an unknown blood invariably brought it into one or other of the four groups. Guthrie and Huck[12] produced evidence in support of the inadequacy of this method. They disagreed with the view that upheld the uni-specificity of the red cells of group A. The absorption of group O serum by cells from group AB should remove agglutinins for groups A, B and AB. Actually agglutinins for groups B and AB and for certain persons in group A were removed. The serum still retained the power of agglutinating other members of group A. The absorption of group O serum by cells of the first type of group A did not remove agglutinins for the second type. Guthrie and Huck, therefore, came to the conclusion that in the second type of group A cells there were additional agglutinating elements, which they termed "C" and "c" respectively. Similar results were reported by other workers and the incidence of this type was placed at a high estimate.

In 1924 Mino[23] and Lattes[21] examined the technique for carrying out blood absorption tests. They found that it was not always possible to

satisfy an agglutinogen nor exhaust an agglutinin by a single absorption. Variation in the degree of absorption tended to give the appearance of additional agglutinating elements. "This variation in the agglutinating power of serums and agglutinophyllic capacity of cells has been established beyond question." (Snyder).

The agglutinin factors were separated from sera O and B by Landsteiner and Witt,[19] one acting on both types of group A cells and the other mainly on one. This points to the existence of qualitative differences in the cells and to the occurrence of true iso-agglutinins. The work of Landsteiner and Levine[18c] who were able to produce specific serum by injecting rabbits with human blood, led to the detection of three agglutinable factors in all four groups. Further, states Landsteiner, if the division of groups A and B into two sub-groups is taken into account it could be established that there are at least 36 different types of human blood. Moreover, iso-reactions of lesser intensity which do not follow the group rule and vary in their specificity are more frequent than was supposed. As these numerous individual blood differences are capable of classification as sub-groups within the four main groups, no modification in the present scheme of grouping is necessary.

PHENOMENON OF AGGLUTINATION

It is a well-known fact that the introduction of certain substances into an animal body will cause that animal to react and produce further substances, known as antibodies, which are antagonistic to the stimulating factor. These stimulating substances, antigens, are probably all of a protein nature, *e.g.*, bacteria, toxins, red blood corpuscles, etc. The combination between antigen and antibody is of a specific nature, but this specificity is regarded as a chemical or a physical one rother than biological. This specificity of antigenic substances may be altered by chemical means; the treatment of proteins by acetylation or methylation alters their antigenic capacity and such cells only react with antibodies developed by such modified proteins. On the other hand, physical modification of protein by boiling, while not interfering with species specificity, prevents such modified protein from reacting with other than boiled protein.

Antibodies, specific for red blood cells, occur normally in the blood of animals. These are known as hæmagglutinins, the antigen in the cells as hæmagglutinogen and the combination of antigen and antibody as hæmagglutination. Agglutination within a species is referred to as iso-hæmagglutinogen, and antigen and antibody, respectively, as iso-hæmagglutinogen and iso-hæmagglutinin.

Three types of reaction may occur when an antigen unites with an antibody. There may be (1) a simple combining process, as with toxin and anti-toxin; (2) physical effects, as in agglutination and precipitation; and (3) the antibody may bring about union with another body normally present in the serum, the complement or alexin. These three groups do not fall into water-tight compartments, as the combination of toxin and anti-toxin may result in a physical change, flocculation.

It is with the second group, agglutination, that we are concerned here. The phenomenon appears to result from the union of antigen and antibody, the process being accompanied by a physical change of the nature of precipitation. Two factors are concerned in this—(1) the combination of agglutinogen and agglutinin, and (2) the actual clumping of the cells. Agglutinins are regarded as having a combining and an agglutinating portion. The latter may be destroyed by heat while the combining portion remains active.

The process of agglutination has been likened to colloidal reactions and while there are undoubtedly similarities there is no analogy for the specificity of the reaction. Molecules in solution are regarded as being kept apart by like electric charges, while surface tension tends to draw them together. Agglutination must therefore be brought about by overcoming the forces which tend to keep the cells apart, by altering the potential between the cells, or by an alteration in the surface tension. In this connection the work of Schroder is of particular interest. She noted that iso-hæmagglutination is always accompanied by a decrease in the electrical charge of the erythrocytes.[32]

It is now known that alcoholic extraction of specific substances results in the formation of a fraction that is specifically binding but which is incapable of acting as an antigen. This fraction does not become antigenic until combined with protein to form what Landsteiner calls "complex antigens." No definite information is available regarding the nature of animal cell antigens, but it is established that group specific substances may be extracted from red blood cells by alcohol and that these are antigenic only when mixed with antigenic proteins. Thus Landsteiner concludes that these specific substances, haptens, vary within a species and it is suspected that analogous differences of proteins also occur. Another interesting point is that haptens, seriologically similar, occur in widely separated species.[18c]

Whatever may be the method by which these specific combinations occur, it is recognised that they behave according to certain definite laws. These will now be dealt with briefly.

THE INHERITANCE OF BLOOD GROUPS

The question of the inheritance of blood groups was investigated by von Dungern and

Hirzfeld[7] in 1910. They put forward the hypothesis that blood groups were inherited as two independent pairs of Mendelian characters, iso-agglutinogens A and B being dominant over iso-agglutinins α and β. This view has now been largely superseded by the multiple allemorph hypothesis of Bernstein.[2] The mating O x AB forms a crucial test of both hypotheses. According to von Dungern and Hirszfeld, this mating would give the following result: O, A, B, AB, and to Bernstein A and AB. Recorded unions favour the latter hypothesis, with, however, a few exceptions. It has now been established that iso-hæmagglutinogens do not appear in a child unless present in one or other of the parents.[29]

Furuhata's hypothesis,[9] giving exactly the same results as that of Bernstein, involves hereditary factors for agglutinins as well as for agglutinogens. These are linked together on a single pair of chromosomes, so closely that crossing over does not occur.

Finally there is Bauer's hypothesis[1] of partial linkage, which, however, is not borne out by genetic facts nor by study of mass family statistics.

Blood Groups in Animals

Horse.

In 1907 Hektoen[13] examined the bloods of a number of horses but was unable to find any evidence of iso-agglutination. Weszeczky[37] in 1920 obtained occasional agglutination reactions but was unable to group them. Pannisset and Verge (1922) stated that iso-agglutination was rarely observed in the horse and that it was impossible to outline a group classification.[28] Hirschfeld and Przesmycki (1923) were the first to arrange horse bloods in groups.[14] On examination of 45 animals, three groups were established, in addition to accessory groups. They used the terminology as applied to human groups, Aβ, Bα, and O$\alpha\beta$. They found that the agglutinins were not always detectable; β of group I was determined in 10 per cent. of cases, α of group II in 60 per cent., α of group III in 100 per cent. and β of the same group in 50 per cent. of cases. Landsteiner and von der Scheer (1924) confirmed the discovery of three groups.[20] In tests with more than 40 samples of blood they found that agglutination was a common phenomenon, but that agglutinins occur less regularly than in human blood. Walsh, however, in the same year was unable to group horse blood.[36] Schwartz (1926) demonstrated the presence of agglutinins.[34]

Schermer and Hofferber (1927) examined 50 horses and noted six different types of blood,[30] namely, 1, Aβ; 2, Ao; 3, Bα; 4, Bo; 5, O$\alpha\beta$; 6, ABo. By combining 1 and 2 and 3 and 4, four groups with the following designation were obtained, 1, Aβ; 2, Bα; 3, O$\alpha\beta$; 4, ABo. Here, also, agglutinins only appeared in a certain percentage of cases: β of group I in 17·5 per cent., α of group II in 17·8 per cent., α of group III in 83 per cent., β of the same group in 83 per cent., $\alpha\beta$ of this group with the AB group in 80 per cent. Eighty-four per cent. of horses were arranged in four groups, the remainder in accessory groups, which appeared to consist of physiologically impossible combinations.[31]

In 1926 Newodow[25] carried out investigations on 1,730 horses and obtained four groups. Dujarric de la Riviere and R. and N. Kossovitch (1930) examined 105 horses in series of 15. They agreed that there were four groups as in man, with some exceptions.[6]

For the sake of comparison the results of various workers are arranged together in the following table.

Group.	Percentage Horses in each Group.		
	Hirschfeld and Przesmycki.	Schermer and Hofferber.	Dujarric de la Riviere, R. and N. Kossovitch.
O			
O	70	44·4	32
A	15	25	16
B	9	25	13
AB	not-demonstrated	5·6	39

Cattle.

Hektoen (1907) failed to find any evidence of agglutination.[13] Ottenberg and Friedman (1911) were able to place 11 steers in three groups.[26a] They assumed the presence of one agglutinogen and one agglutinin in the blood and their groups were composed as follows:—Ao, Oα, Oo. Fishbein (1913) examined 60 cattle and obtained occasional reactions.[10] In 1920 Weszeczky reported negative results.[37] Pannisset and Verge (1922) detected intense agglutination in a number of combinations, but found no evidence of fixed blood groups.[28] Krashner obtained results when different breeds of cattle were cross-agglutinated. He noted two groups, (1) a large one in which cells were not agglutinated, and (2) a smaller group, the serum of which had no agglutinating capacity.[17]

Schermer (1928) attempted to repeat the results of Ottenberg and Friedman.[31] He used 50 cows belonging to the Black and White Lowland breed, but as expected reactions were not obtained, other breeds, Simmertal, Harz and Franconian were tested. He was unable to confirm the results of Ottenberg and Friedman but points out that the absence of an A or an anti-A group would make all reactions negative. It was possible that one of these groups was so rare amongst these cattle that it might not have come under observation. Fetth (1930) examined Hungarian stepp cattle and Simmertals and found three groups similar to those of Ottenberg and Friedman.[11]

Sheep.

Hektoen was unable to obtain agglutination

reactions.[13] Fishbein,[10] however, succeeded in finding occasional results. Bialosuknia and Kaczowski examined 151 sheep in groups of 20-24 and found a blood corpuscle factor and a serum factor anti-A. They were thus able to arrange the sheep into three groups: (1) agglutinogen but no agglutinin, A_o; (2) agglutinin but no agglutinogen, O_a; (3) neither agglutinogen nor agglutinin, O_o. The group distribution was respectively as follows:—group I, 44 per cent.; group II 25 per cent.; and group III, 31 per cent.[31] Schermer confirmed this group structure and obtained the following distribution: group I, 40 per cent.; group II, 23·3 per cent.; and group III, 36·3 per cent. As in the horse, the absence of positive reactions where, from the results obtained, they might have been expected, was noted. Duhig[8] reports the existence of at least two groups in Australian sheep.

Pigs.

Fishbein examined 60 swine and obtained occasional iso-agglutinations.[13] Weszeczky also got positive results but was unable to group them.[37] Szmanowski, Stetkiewicz and Wackler[35] and Bercyz[4] were able to arrange their results into groups, similar to those found in sheep. Schermer reported similar results and stated that the reaction in this animal was very clear and definite.[31] There were no cases where the reaction failed to appear as in the horse. The following group distribution was obtained: group I, 35 per cent.; group II, 55 per cent.; and group III, 10 per cent.

Goat.

Hirschfeld[14a] and Schermer[31] both failed to find any evidence of iso-agglutination in this animal.

Dog.

Hektoen[13] did not obtain any positive reactions, nor did Ingebristen.[15] Von Dungern, on the other hand, describes four groups.[7] Fishbein examined 10 animals and found occasional iso-agglutinations.[10] Ottenberg, Friedman and Kalisky[26a] also obtained occasional reactions but were unable to group them. Zwetkow[38] described several groups and sub-groups.

Cat.

Ingebristen examined 40 cats and obtained inter-agglutination in five cases but no evidence of grouping.[15]. Ottenberg and Thalimer confirmed the lack of groups.[27]

Rabbits.

The only evidence in support of the existence of groups in this animal is that of Ottenberg and Friedman, who defined four groups on the examination of 32 rabbits.[26a] Fishbein[13] found occasional iso-agglutination in 25 animals, but all other workers, Hektoen,[13] Weszeczky[37] and Snyder[33] failed to obtain agglutination.

Guinea-Pig, Rat and Mouse.

Hektoen[13] and Weszeczky[37] found no evidence of iso-agglutination in the guinea-pig, and Rdodenberg[29] failed to find a positive reaction in 50 rats, as did Macdowell and Hubbard[22] in mice.

Fowls.

Weszeczky[37] found no agglutination, but Karshner[17] defined four groups.

Frog.

Fishbein[13] examined 20 frogs but was unable to group them.

BLOOD GROUP INVESTIGATIONS IN EQUINES

Specimens of blood for this purpose were obtained from two sources: (1) Shetland ponies, and (2) Clydesdales. The microscopic method as used to determine human groups was first employed, but as this proved inadequate it was discarded in favour of the macroscopic method, described below.

The cells and sera of 11 of these ponies were typed against each other and an attempt made to determine the reactions microscopically. None of the reactions, however, could be read with ease; some were definitely positive and many gave evidence of some interaction, but on the whole it was impossible to decide what was actually a positive or a negative result.

It is possible that the incomplete clumping of cells may have been due to pseudo-agglutination or "cold" agglutination. "Cold" agglutination is the non-specific clumping of cells, even in their own serum, at low temperatures, 0 to 5° C. In animals this may occur up to 20° C., so experiments carried out at room temperatures may be adversely affected and non-specific results obtained.

A further explanation lies in the fact that from subsequent results the agglutinins in the serum of horses were found to be weak in many cases. Whatever the cause, it was impossible to obtain definite results from these animals by this method and as they were later moved to premises which were not licensed for animal experimentation no further work was carried out on them.

Technique

Blood was collected into potassium oxalate to prevent coagulation, the serum separated, the cells washed once with normal saline and a 2 per cent. suspension made in normal saline. Originally a 1 per cent. suspension was used, but this was increased to 2 per cent. with more satisfactory results. 0·1 c.c. of a 10 per cent. solution of formalin was added to 6·0 c.c. of the cells suspension and both cells and serum were stored in a refrigerator. The maximum period for which they were kept was two weeks.

For the actual test 0·2 c.c. of the cell suspension was added to 0·1 c.c. serum, the mixture

shaken and placed in an incubator at 37° C. for 12 hours. Controls with normal serum and with serum against the cells of the same animal were made from each blood.

RESULTS

Sixty-one animals were examined in three series of 21, 21 and 19. The outstanding feature was the small number of positive reactions that occurred. Combinations to the number of 1,107 were carried out and agglutination was observed in only 16·34 per cent. cases.

The following results were obtained, taking the agglutinogen content of a blood as a criterion of its group.

Group O	... ...	24·59 per cent.
Group A	... ...	31·15 per cent.
Group B	... ...	37·70 per cent.
Group AB	... ...	6·56 per cent.

It was found that all the bloods examined could not be grouped in this way. The blood of eight horses appeared to consist of physiologically impossible combinations of agglutinogens and agglutinins, as, for example, Bβ, B$a\beta$, Aa, A$a\beta$, and AB$a\beta$. 86·88 per cent. of horses examined fell into the main groups and the remainder into accessory groups. If these anomalous results were disregarded and only the bloods of those horses which comprised the main groups were examined it would be seen that the percentage composition of each group would be capable of some degree of modification. Owing to the extreme variation in the agglutinin content of horse blood, however, it appeared probable that a more accurate estimate of the four groups could be arrived at by considering solely the agglutinogen content.

Complete absence of agglutinins was noted in 14 animals, *i.e.*, 22·95 per cent. Two horses contained neither agglutinogen nor agglutinin. Group Ao appeared in four animals, Bo in five and Abo in three.

The examination of the groups was considerably complicated by the fact that in many instances, in which from results obtained an interaction between agglutinogen and agglutinin might have been expected, the agglutinins failed to appear. β of Aβ failed to appear in 52·4 per cent. of cases, a of Ba in 57·4 per cent., a of O$a\beta$ in 45·6 per cent., and β of O$a\beta$ in 55·2 per cent. On the whole a appeared almost equally with β. The a of O$a\beta$ was much more frequent than the a of Ba, while β of O$a\beta$ appeared almost equally with the β of Aβ.

DISCUSSION

By assuming the presence in the blood of the horse of two iso-agglutinogens and two iso-agglutinins, similar to those of human blood, it was possible to arrange the majority of the animals examined into four groups. The obvious differences found between human and equine iso-agglutinations were (1) the fact that it was necessary to conduct the experiments at 37° C. to obviate non-specific results; (2) the macroscopic method was imperative; (3) the great variation in the degree of the intensity of the reactions; and (4) the relatively large percentage of horses that could not be grouped under the above classification.

SERIES I.
21 Horses.

		β				a				o	β		o			o	a	β	$a\beta$			
		Z3	L3	L9	L12	L10	L15	L8	L18	Z2	L16	Z5	L14	L11	L13	Z1	L17	Z6	L2	L4	L5	Z4
A	Z3	—	—	1/1	1/1	1/1	1/1	1/1	1/1	—	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	+	⊕	⊕	⊕
	L3	—	—	—	—	⊕	⊕	+	+	—	—	—	—	—	—	—	⊕	—	+	⊕	⊕	⊕
	L9	—	—	—	—	⊕	⊕	⊕	⊕	—	—	—	—	—	—	—	⊕	—	+	⊕	⊕	+
	L12	—	—	—	—	+	+	⊕	⊕	—	—	—	—	—	—	—	⊕	—	⊕	+	+	+
B	L10	+	⊕	+	⊕	—	—	—	—	—	⊕	+	—	—	—	—	—	⊕	+	⊕	+	+
	L16	+	+	⊕	⊕	—	—	—	—	—	⊕	⊕	—	—	—	—	—	⊕	⊕	⊕	+	+
	L16	⊕	⊕	⊕	⊕	—	—	—	—	—	⊕	+	—	—	—	—	—	⊕	⊕	⊕	⊕	⊕
	L8	⊕	⊕	⊕	⊕	—	—	—	—	—	⊕	⊕	—	—	—	—	—	⊕	⊕	+	⊕	⊕
	Z2	⊕	+	1/1	1/1	1/1	1/1	1/1	1/1	—	1/1	1/1	1/1	1/1	1/1	—	1/1	1/1	+	⊕	+	⊕
	L18	+	⊕	⊕	⊕	—	—	—	—	—	+	+	—	—	—	—	—	⊕	⊕	⊕	⊕	⊕
	Z5	+	⊕	+	⊕	—	—	—	—	—	⊕	⊕	—	—	—	—	—	⊕	⊕	+	+	+
A B	L14	+	+	⊕	+	⊕	⊕	+	+	—	+	⊕	—	—	—	—	+	+	+	+	+	+
	L11	+	⊕	⊕	+	⊕	+	⊕	⊕	—	+	⊕	—	—	—	—	+	⊕	⊕	+	+	+
	L13	+	⊕	+	+	+	⊕	⊕	+	—	+	⊕	—	—	—	—	+	+	+	+	+	+
O	Z1	1/1	—	1/1	1/1	1/1	1/1	1/1	1/1	—	1/1	1/1	1/1	1/1	1/1	—	1/1	1/1	—	—	—	—
	L2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	L4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	L5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Z6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	L17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Z4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

A, B, AB, O = Agglutinogens. $a, \beta, a\beta, o$ = Agglutinins. + = Agglutination. — = No agglutination. ⊕ = No combination of serum and cells made.

This variation in the degree of intensity of the reactions included the whole scale of markedly positive combinations, combinations not so marked and those cases in which the agglutinins failed to appear. This would seem to indicate a difference in the agglutinin content of equine serum. It is this that renders the macroscopic method imperative and even this is not infallible. Several combinations of what might be termed border-line cases were noted, probably due to a weak agglutinating capacity. These proved to be exceedingly difficult to differentiate and it was only after a careful examination of the controls that a decision could be made. It was therefore concluded that this technique is not adequate for detecting all iso-agglutination reactions in the horse and that, in future, a method by which these border line cases might be eliminated, such as by the development of specific antibodies consequent on animal inoculation, should be utilised.

While it might be possible to eliminate those reactions which appeared to result from horses with physiologically impossible combinations of agglutinogen and agglutinin by assuming the presence of additional elements in the blood, it seems preferable to account for them rather by variation in the agglutinin content and in other factors concerned in the reaction. According to Landsteiner, iso-agglutination reactions, in man, of lesser intensity, which do not follow the group rule and which vary in their specificity are more frequent than was supposed. It may be, as Landsteiner suggests, that the haptens vary within a species, that one type of cell is better able to enter into combination than another.

This variation in the combining power of agglutinogens is well illustrated in Series III. Agglutinogen A in blood L34 has sufficient combining affinity to allow of agglutination occurring with bloods L37, Z15, Z17, L40 and L43, all of which contain α. L35 has a lower combining capacity than L34 and agglutination only occurs with L37, L43, L36. L42, L43 and L45 have a still lower combining power; so low, in fact, that it prevents the occurrence of agglutination. This variation in the combining capacity of the agglutinogens is also accompanied by a variation in the agglutinins in these five bloods. L35 has a lower combining capacity than L34, yet there is sufficient agglutinin in L37 and L43 to cause agglutination of cells of L34 and L35. Z15, Z17 and L40 seem to have insufficient agglutinins to cause clumping of the cells of L35 but yet sufficient to clump the cells of L34.

Several animals were discovered which had neither agglutinogen nor agglutinin in their blood. When the variation in the activity of the agglutinins, in the combining power of the agglutinogens, the apparent absence of agglutinogens and agglutinins in some cases and the number of horses which could not be grouped in the accepted scheme are considered, it seems permissible to state that the horse, as regards the specificity of its blood group reactions, is much less highly developed than man.

SERIES II.

21 Horses.

		β						o			a				o			a	o		$a\beta$	$a\beta$
		L19	L23	Z12	L26	L27	L28	Z8	L24	L25	Z7	L22	Z10	Z11	L29	Z13	L31	Z9	L30	Z14	L21	L20
A	L19	—	—	1/1	1/1	1/1	1/1	—	—	—	+	⊕	+	1/1	1/1	1/1	1/1	⊕	1/1	1/1	⊕	+
	Z8	—	—	—	—	—	—	—	—	—	⊕	+	+	+	—	—	—	⊕	—	—	⊕	⊕
	L23	—	—	—	—	—	—	—	—	—	⊕	+	⊕	+	—	—	—	⊕	—	—	+	⊕
	L24	—	—	—	—	—	—	—	—	—	⊕	+	⊕	⊕	—	—	—	+	—	—	+	⊕
	L25	—	—	—	—	—	—	—	—	—	⊕	+	⊕	+	—	—	—	⊕	—	—	+	⊕
	Z12	—	—	—	—	—	—	—	—	—	⊕	⊕	+	⊕	—	—	—	+	—	—	+	+
	L26	—	—	—	—	—	—	—	—	—	+	+	+	⊕	—	—	—	+	—	—	+	⊕
	L27	—	—	—	—	—	—	—	—	—	+	⊕	+	+	—	—	—	⊕	—	—	+	+
	L28	—	—	—	—	—	—	—	—	—	+	+	+	+	—	—	—	+	—	—	+	+
B	Z7	+	+	1/1	1/1	1/1	1/1	—	—	—	—	—	—	1/1	1/1	1/1	1/1	—	1/1	1/1	⊕	+
	L20	⊕	+	1/1	1/1	1/1	1/1	—	—	—	—	—	—	1/1	1/1	1/1	1/1	—	1/1	1/1	+	⊕
	L22	⊕	⊕	⊕	+	⊕	+	—	—	—	—	—	—	—	—	—	—	—	—	—	⊕	+
	Z10	⊕	⊕	⊕	⊕	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—	+	⊕
	Z11	+	⊕	⊕	+	⊕	+	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+
	L29	⊕	⊕	+	+	⊕	⊕	—	—	—	—	—	—	—	—	—	—	—	—	—	+	⊕
	Z13	⊕	+	+	+	⊕	⊕	—	—	—	—	—	—	—	—	—	—	—	—	—	⊕	+
	L31	+	⊕	+	⊕	+	⊕	—	—	—	—	—	—	—	—	—	—	—	—	—	⊕	+
O	Z9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	L30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Z14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	L21	—	—	1/1	1/1	1/1	1/1	—	—	—	—	—	—	1/1	1/1	1/1	1/1	—	1/1	1/1	—	—

+ = Agglutination. — = No Agglutination. ⊕ = Agglutination failed to occur.
1/1 = No combination of cells and serum made.

It does not therefore seem probable that it will be possible, at least within present methods of technique, to indicate a breed distribution of groups. Schermer, however, has attempted a distinction between a thoroughbred and a heavy breed of horses. In human work it has been shown that the incidence of the groups varies in different races. If such could be shown to be the case in the horse it would be of value in assessing the degree of relationship between different breeds. As the matter stands at the moment, however, it seems unlikely that this will be the case.

An examination of the literature at the beginning of this paper on iso-agglutination reactions in animals will show that these have been noted in the majority of animals, namely, in horse, cattle, sheep, pig, dog and cat and also in the fowl. There is no evidence of agglutination occurring in the goat, guinea-pig, rat, mouse, nor frog.

There is considerable diversity of opinion in the published results of iso-hæmagglutination experiments in animals. This cannot be accounted for merely by differences in the technique of workers, although in the case of early workers this must be considered. It is undoubtedly due to differences, specific and non-specific, in the blood factors themselves.

On the whole, the evidence is in favour of the occurrence of blood groups in cattle and the inability of some workers to determine these groups may point to the existence of definite types of blood, peculiar to particular breeds of cattle. The existence of three groups in sheep and swine would also seem to have been proved. No groups have been described in the cat and as regards the dog, rabbit and fowl, the evidence is inconclusive.

It is obvious that there is a distinct gradation in the combining capacity of agglutinogen and agglutinin in the different animal species. The combination is most marked and specific in man, next appear to come pig, sheep and cattle. The dog, rabbit and fowl are intermediate, while at the extreme end of the scale come the guinea-pig, rat, mouse and frog. Modifications in this scheme will doubtless become evident as time goes on. The goat, for example, seems to be out of place in this scheme and it may eventually take its place higher up the scale.

The possibility of breed distribution of blood groups appears to be more definite in cattle, sheep and pigs than in the horse. The reaction in these animals, particularly in the pig, would seem to be more distinct than in the horse. This question of breed distribution of groups, however, is no more than a possibility at present and all the evidence so far is of a negative nature. Bialosuknia and Kaczowski conclude that it is impossible to distinguish breeds of sheep by means of the iso-agglutination reaction because the same groups are present in various breeds. It may be, however, that one serological type is more frequent in one breed than in others. A study of the frequency of appearance of blood groups in various breeds

SERIES III.

19 Horses.

		β			o	a					o		$a\beta$		a		$a\beta$			
		L34	L35	L36	L42	L37	Z15	Z17	L40	L43	L46	Z18	L41	L44	L47	Z19	L39	L38	Z16	L46
A	L34	—	—	—	—	+	+	+	+	+	—	1/1	⊕	⊕	⊕	1/1	+	+	+	⊕
	L35	—	—	—	—	+	⊕	⊕	⊕	+	—	1/1	+	+	⊕	1/1	+	⊕	+	+
	L36	—	—	—	—	⊕	⊕	⊕	⊕	⊕	—	1/1	+	+	⊕	1/1	+	+	⊕	+
	L42	—	—	—	—	⊕	⊕	⊕	⊕	⊕	—	1/1	+	+	+	1/1	⊕	+	⊕	+
	L43	—	—	—	—	⊕	⊕	⊕	⊕	⊕	—	—	+	⊕	⊕	+	⊕	⊕	⊕	⊕
	L45	—	—	—	—	⊕	⊕	⊕	⊕	⊕	—	—	+	+	+	+	⊕	⊕	+	⊕
B	L37	+	+	+	—	—	—	—	—	—	—	1/1	⊕	+	—	1/1	+	+	⊕	+
	L38	+	⊕	+	—	—	—	1/1	—	—	1/1	1/1	⊕	1/1	1/1	1/1	+	⊕	+	1/1
	Z15	+	+	⊕	—	—	—	—	—	—	—	1/1	+	+	—	1/1	⊕	+	+	+
	Z16	+	+	⊕	—	—	—	—	—	—	—	1/1	⊕	⊕	—	1/1	+	+	⊕	⊕
	L46	⊕	⊕	+	—	—	—	—	—	—	—	—	+	+	—	1/1	⊕	⊕	+	+
	Z17	+	⊕	⊕	—	—	—	—	—	—	—	—	⊕	+	—	—	⊕	⊕	⊕	⊕
	Z18	⊕	⊕	+	—	—	—	—	—	—	—	—	⊕	+	—	—	⊕	+	+	⊕
	L40	+	+	+	—	—	—	—	—	—	—	—	+	+	—	—	⊕	+	+	⊕
A B	L39	+	⊕	⊕	—	⊕	+	+	+	⊕	1/1	+	1/1	1/1	1/1	1/1	⊕	⊕	+	1/1
O	L41	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	L44	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	L47	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Z19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

+ = Agglutination. — = No agglutination. ⊕ = Agglutination failed to occur.
1/1 = No combination of cells and serum made.

may prove of interest from an evolutionary aspect.

There is little that can be said about the practical importance of blood groups in animals. Blood transfusion is very rarely carried out and from the few records in existence, it appears to have been done successfully without reference to iso-agglutination reactions. It is well, however, to bear in mind the possibility of adverse results occurring from the transfusion of unknown bloods, not perhaps quite so much in the horse as in cattle, sheep and pigs where the reaction seems to be more intense and regular.

Summary

(1) The salient features of blood group work in man are reviewed briefly.

(2) The literature on iso-agglutination reactions in animals is dealt with extensively.

(3) In an examination of 61 horses of a heavy breed, four blood groups could be differentiated: group O, 24·59 per cent.; group A, 31·15 per cent.; group B, 37·70 per cent.; and group AB, 6·56 per cent.

(4) 86·88 per cent. of animals were grouped in this way, the remainder fell into accessory groups.

(5) A number of horse bloods contained neither agglutinogen nor agglutinin.

(6) It is concluded that the horse, as regards the specificity and occurrence of blood group reactions, is less highly developed than man, due, probably, to variation in the activity of agglutinins and in the combining power of agglutinogens.

(7) The possibility of using blood group reactions as a means of differentiating breeds of animals is discussed briefly.

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MEAT INSPECTION IN SCOTLAND

In the new regulations, governing the supply of meat, made by the Department of Health for Scotland: "No person is qualified to act as a meat inspector under them unless he is either the Medical Officer of Health of the area, a veterinary surgeon, or a person who has received special training in the work of meat inspection, and, prior to June 1st, 1932, has had not less than seven years' practical experience in that work, and has obtained a certificate from the Department."

Clinical Communications

TORSION OF THE WOMB IN A MARE

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Subject.—An active, nervous, cart mare.

Attendance was urgently requested at about 2 p.m. on April 24th, the information being advanced that she had then been in pain for about half an hour, and had, moreover, shown pain for about an hour between 3 and 4 a.m. that morning. In the meantime she had been quiet.

On arrival the mare was continually going down, straining with considerable force, and rising after a short period. The vulva looked if anything smaller than normal for a barren mare. Manual examination revealed torsion of the womb. While straining was active the hand could reach only to about the foremost limits of the vagina, but taking advantage of quiescent periods the fœtus could eventually be felt through its envelopes.

The animal was given chloral hydrate subcutaneously and removed to a straw yard. Abortive attempts were made to get on her head while lying flat. Eventually, while a hand in the passage absorbed her attention, ropes were attached to the under legs fore and hind, and she was rolled over on to her other side. One could not keep an arm in the passage during the rolling but examination after it revealed, firstly, that the torsion was no worse, and secondly that it did not seem greatly altered. The mare was allowed to rise, and when she went down again the rolling was repeated in the same direction.

It was now possible to introduce the hand fairly freely into the womb and feel the forelimbs and head, but it was also evident that the twist was not absolutely corrected. It was, however, found possible to guide the head, after cording it, and the forelegs into the passage, and to effect delivery, the most immediate danger appearing to be that of the feet being forced into the vaginal wall. The foal, a big one, died during delivery; I believe he was drowned in the fœtal fluids.

The mare was reported to be in a satisfactory condition that night and has progressed favourably since, with this exception: at the injection sites, one on either side of the neck, a hot inflammatory swelling was produced and abscess formation seemed likely. On the morning of May 5th it was reported that she had seemed a "little funny in her head." She was not showing any pronounced brain symptoms when seen, but these are occasional sequelæ to the hypodermic use of chloral hydrate. When last seen on May 11th the swellings were considerably smaller and less painful. No history was advanced of any incident likely to have occasioned any displacement of the womb: it would, one would think, require a jerk of considerable violence, and one would therefore expect to meet with the condition more frequently in hunters and thoroughbred mares. Possibly it happened during rolling, but I do not remember seeing a pregnant mare roll, at least when getting heavy, except from pain.

* * * * *

COLLOIDAL MANGANESE IN SUSPECTED GRASS DISEASE

G. D. W. DAVIDSON, M.R.C.V.S.,
Castle Douglas

Last autumn I had a case, which I diagnosed as grass disease, in a gelding: every symptom but that of spasm of the glottis being exhibited. However, when I started to give a drench of oil, turpentine and aloes, the spasm of the glottis was evidenced.

Having been using a great deal of colloidal manganese for "weeds" in cattle with good results, I thought I would try a dose into the gelding. Accordingly, I gave 10 c.c. intramuscularly, but warned the farmer not to base any hope upon it. Later, the farmer 'phoned me to come and give the animal another dose, as it was considerably better. I repeated the injection and gave the horse still another in five days, administering three injections in all. The horse made a complete recovery.

Grass disease is very uncommon in this part of the country and I have not had a case since to see if this procedure would prove equally efficacious. I may have been treating some other condition, but recount this incident in case there might be something in this mode of treatment. Some practitioner who has cases might give it a trial.

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Abstracts

[A Practical Method for the Diagnosis of Pregnancy in the Mare. Hart, G. H., and Cole, H. H. *Jour. Am. Vet. Med. Assocn.* *LXXX.* April, 1932. 604-614.]

In this article are recorded the results of studies in the mare undertaken in an endeavour to apply to that animal the biological test for pregnancy based upon the presence of increased amounts of the ovarian hormone, folliculin or œstrin, and the sex-maturing hormone of the anterior hypophysis, in the blood serum and urine. In an animal of so long a gestation period as the mare, it is at times of considerable importance for breeders to have definite knowledge of the existence of pregnancy at the earliest possible date following service.

The authors have shown that the blood of non-pregnant mares does not contain any substance in sufficient concentration at any stage in the œstrus cycle to elicit a response in the genital system of the immature mouse or rat (the test-injection animals used) when the serum is given in doses up to 30 c.c. After breeding which results in conception, the reactions are uniformly negative up to the 37th day of pregnancy, the time of the first reaction with serum from pregnant mares varying from the 37th to the 42nd day of pregnancy. The concentration of the hormone in the blood increases rapidly during the few days following its first appearance, and after the 42nd day of pregnancy the serum has a tremendous effect upon the size of the ovaries of the test animals, and changes are regularly induced in the vagina and uterus. A maximal effect is produced between the 43rd and 80th days of pregnancy, after which time there is a gradual diminution in effect until about the 180th day of pregnancy, when the test ovaries are again comparable in size to the ovaries of the controls.

Tests made with serum taken from a mare on the 121st day of pregnancy showed that 30 c.c. of serum were required to produce the œstrum reaction, whereas 1 c.c. was sufficient to demonstrate the sex-maturing hormone. The concentration of the anterior hypophyseal hormone in the urine of mares is very low as compared with that in their blood, and for this and many practical reasons (given) the use of blood serum for the test is preferred to that of urine. The mares to be tested should have been bred about 45 days previous to the time when the blood sample is taken: the technique of this procedure and of injection into the test and control rodents and their subsequent examination is detailed.

It is significant to know that in the mare there are four typical reactions to be obtained from the test rodents, varying in degree and parts of the genital tract affected, depending upon the stage of pregnancy. The authors describe these reactions and comment "That the reaction obtained in immature rats by the injection of serum taken from mares 45 to 120 days after breeding is of great value in diagnosing pregnancy is beyond doubt. During this period one is impressed with the uniform results obtained." It would appear that a reduction in the concentration of the hypophyseal hormone takes place late in pregnancy; therefore at this period larger doses will be necessary to produce reactions in the test animals—but other means of diagnosing pregnancy in the mare are available during this period. At the really difficult and therefore all-important earlier stages, the simplicity of the test, its high degree of accuracy, and its low cost where facilities are available (breeding colonies of white mice or rats are maintained in many biological laboratories) will render its use a justifiable procedure under a great variety of conditions, thus eliminating much guess-work regarding the existence of pregnancy in brood mares. For example, where such are being sold at public or private sale, their value might be greatly enhanced if it could be stated positively that they actually were in foal; or mares sent to a breeding farm till in foal by the stallion kept there, could, were this test applied, be sent home far earlier than would otherwise be possible. Again, mares bred early in the season and showing no further signs of heat are usually considered settled, but such may not be the case. If a negative test for pregnancy were obtained in such cases, means might be used to bring them in heat so that they could again be bred before the close of the breeding season. Finally, mares may be purchased for work under conditions in which pregnancy would be highly undesirable, and this test could definitely eliminate them from such purchases.

W. B.

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[Streptococcic Sepsis in Newly-born Puppies. Barzewitsch and Alexandrow. *D.T.W.* No. 7. February 13th, 1932. 102.]

On two consecutive years most of the puppies of an Alsatian bitch died during their first week of life. The hygienic conditions were faultless, and the puppies appeared well-nourished and healthy until the third or fourth day, when they became listless and died without apparent cause, although a little diarrhœa was noticed. The navel was normal, but on *post-mortem* a small quantity of serous exudate containing flocculi was present in the abdominal cavity. The mucous membrane of the intestine was congested. No other changes were observed, but a streptococcus was obtained in pure culture, which, however, proved non-pathogenic for experimental animals. W. L. S.

[**Calcium Therapy in Bovine Parturient Paralysis.** Sjollema, Seekles and van der Kaay. *D.T.W.* No. 10. March 5th, 1932. 149.]

These authors refer to their previously published work on the above subject, which showed that the intravenous injection of calcium in cases of parturient paresis in cattle is frequently followed by severe palpitations of the heart which occasionally cause death from heartblock. Owing to the connection which they have established between the mineral composition of the blood and dangerous palpitations, the authors discarded the use of pure calcium salt solutions. Instead, they recommend the intravenous injection of a solution composed of 40 grams crystallised calcium chloride and 15 grams crystallised magnesium chloride in 300 c.cs. of water. The dangerous action of calcium on the heart is by the above solution almost abolished. Veterinary surgeons in the Netherlands have used this mixture in at least 2,000 cases of parturient paresis with satisfactory results. Only animals with a normal heart action should be submitted to this treatment, which is most suitable in the post-partum type. The injection is made slowly and should occupy not less than four minutes.

W. L. S.

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[**Researches into Swine Fever and Paratyphus of Young Pigs.** Manninger. *D.T.W.* No. 8. February 20th, 1932. 113.]

This article consists of a critical discussion of the pathological changes which occur in swine fever and in paratyphus of young pigs, which latter disease is stated to be one of the most important attacking animals under the age of six months. The author was stimulated to renew his researches into paratyphus by observations that a disease simulating swine fever may cause death among young pigs, whereas the older animals remain exempt, although there was no reason to think they were immune to swine fever. Further, the author has met cases where alleged swine fever, even after the appropriate serum treatment, continued to be followed by severe loss. One such outbreak is quoted in detail and was proved by animal experiments to be acute paratyphus (*B. suipestifer septicæmia*) unconnected with swine fever. On *post-mortem* the animals showed a pronounced hæmorrhagic diathesis, with dark red colouration of the lymphatic glands and a hyperplastic condition of the spleen. With the exception of the spleen abnormality, the lesions were those regarded formerly as characteristic of swine fever.

Since paratyphus may occur independently and also as a complication of swine fever, and because of the difficulty of exact diagnosis, the author has noted the course of these diseases in a number of artificially infected pigs. Pure swine fever showed a typical temperature curve, accompanied by diarrhœa, inappetence, cough and difficult breathing, with death occurring in from 9-19 days. The *post-mortem* appearance varied with the length of the illness, but in general consisted of a hæmorrhagic diathesis, croupous pneumonia with necrosis, diphtheroid deposits and occasionally characteristic ulceration. The spleen was normal in all cases. When paratyphus was introduced as a complication of swine fever it caused noticeable changes in the spleen due to colonisation of the micro-organisms in that organ. The changes varied from hyperæmia to hyperplasia, when the organ is stated to be considerably enlarged with blunted edges, a brownish-red colour and to have the consistency of India rubber. The author concludes that in uncomplicated swine fever the spleen remains normal, and that hyperæmia or a hyperplastic spleen is evidence of *B. suipestifer* infection, which may be present as a complication of the virus infection. It is probable that the intercurrence of paratyphus results in an increased tendency to a hæmorrhagic diathesis, and Birch is quoted, who in 1922 affirmed that *B. suipestifer* " seems to intensify hæmorrhagic lesions produced by the filterable virus."

With regard to differential diagnosis, it is clear that difficulty will be encountered in deciding between specific paratyphus and paratyphus occurring during the course of swine fever. From the standpoint of treatment, however, the matter is of some importance and the best results are to be expected from close cooperation between the laboratory and the practitioner. A bacteriological examination is helpful, also the examination of a number of cadavers in order to follow the changes in the pathological picture.

W. L. S.

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[**Primitive Epithelial Cancer of the Kidney in the Dog.** Valade, Veterinary Captain, *Bulletin de L'Académie Vétérinaire.* Vol. v., No. 1, 3 figures.]

Several cases of epithelial cancer of the kidney in animals have been recorded. In 1910 Petit noted two cases in the horse with generalisation to the lung and one case in the dog in which the pleura and lungs were involved.

In 1929 Blanchard and Montpelier published a memoir on the epithelial tumours of the kidney in the horse. From their study of 250 tumours collected at a horse abattoir they concluded that: (1) of the epithelial tumours found in the horse 1/12th occur in the kidney; (2) in relation to all tumours epithelioma of the kidney is in the horse of greater frequence than in human pathology.

A fox terrier, 15 months old, on examination

at the Alfort College was found to have a swelling amounting to deformity in the left flank. No gravity was suspected as the dog was in good condition and had an excellent appetite.

On palpation a large tumour was detected, filling the abdomen. The case was pronounced incurable and destruction was advised and was carried out.

Clinically it is to be remarked that the youth of the patient agrees with what is observed in human pathology, cancer of the kidney being commoner in the child than in the adult. In man hæmaturia points to kidney neoplasm; it was absent here. On *post-mortem* an enormous tumour was found, involving the left kidney and almost filling the abdomen. The right kidney was normal; there was no generalisation, nor were there any other marked changes.

Macroscopic characters.—The tumour weighed over three pounds and was about the size of a child's head. The general form of the kidney was maintained, having, however, an irregular surface. It was covered by a vascularised fibrous membrane representing the kidney capsule. Pushed to the right and superior part of the tumour was what appeared to be the kidney parenchyma.

Sections showed that the tumour was formed of lobulated areas partitioned by a vascularised fibrous tissue. The section was opaque, yellow and fatty looking. Sections made where the renal structure appeared to be normal showed that the organ was reduced to one-fourth its ordinary size. The cortical and medullary zones could be made out as well as the pelvis into which cancer masses projected.

Histological characters.—A section taken from the periphery, near where kidney tissue seems intact, showed the following details. Under the low power the cortical zone is recognised by the presence of some glomeruli of Malpighi. The medullary zone is sclerosed. As the tumour tissue is neared the fibrous tissue becomes denser and forms a sort of shell round the mass. The framework is formed by numerous connective tissue bands given off from this shell. The tumour shows irregular tubes and microcysts, the walls of which are shaggy with papillary vegetations, tubes and vegetations being clothed with epithelial cells. Under the high power three aspects are observed: epithelial cells line tubes of a structure analogous to that of the convoluted tubules; more often these cells cover the vegetations and finally the cells are collected in masses where from reciprocal pressure they are polygonal. These cancer cells have much protoplasm and a large nucleus. This structure agrees with that described by Masson under tubulo papillary epithelioma formed at the expense of the epithelial cells of the renal tubes.

W. R. D.

[A Case of Paralysis of the Trigeminal Nerve in the Horse, accompanied by Keratitis Neuroparalytica caused by Metastases along the Trigeminal Nerve Branches from a Primary Cancer of the Third Eyelid. Hallgren, W., and Andersson, A. (1932). *Skand. Vet.-Tdskr.* 4. 133-146. 2 figs., 25 refs.]

The authors describe the clinical, macroscopic and microscopic features of a case of carcinoma of the third eyelid in the horse which metastasised centripetally along the ophthalmic nerve and then centrifugally along the other two branches of the trigeminal, the maxillary and the mandibular nerves.

The subject was a 10-year-old mare which in June, 1929, developed conjunctivitis of the right eye. At this time on the inner surface of the third eyelid (right) was a sessile area of new tissue about the size of a bean built up of many small nodules. This was removed (June 15th, 1929), together with the related part of the third eyelid and adjoining tissues. The symptoms subsided only to reappear in six weeks. During the succeeding fourteen months local symptoms increased so that on August 14th, 1930, the eyelids were practically closed, the third eyelid and eyeball were immovable and the latter showed a keratitis, the cornea being impermeable to light.

About August 1st, 1930, the horse exhibited difficulty in mastication. Within two months (September 10th, 1930) the masticatory muscles of the right side were considerably atrophied, the right ear drooped and the lips were drawn to the left side. The skin over the right side of the face was anæsthetised as were also the mucous membrane lining the right nostril, the right cheek and right half of the tongue and lips. Swallowing was not interfered with. The animal was destroyed.

The macroscopic and microscopic examination after death are described in detail and lead to the conclusion that a primary carcinoma of the third eyelid which at death was the size of a hen's egg had spread centripetally by way of the peri- and endoneural lymphatic vessels and spaces along the ophthalmic nerve until it reached the trigeminal main branches and then metastasised in a centripetal direction along the maxillary and mandibular nerves. The authors remark that, while cancers of the third eyelid are not uncommon amongst domestic animals, particularly the horse, metastasis, as described above, is distinctly rare. Analogous cases have been recorded in man (Kümmel) and in the horse by Joest, where, however, the growth was sarcomatous.

The observation by Magendie that section of the optic nerve was succeeded by disease processes in the eye led to the recognition of the relation between clinical pathological change in

the eye and disease of the optic nerve (*e.g.*, keratitis neuro-paralytica). Under such conditions the cornea loses its sensitiveness, secretion of tears is suppressed, eyelid movements are less frequent and so the cornea becomes the site of degeneration processes with final necrosis of epithelium.

G. B. B.

Report

SURREY COUNTY COUNCIL

ANNUAL REPORT OF THE CHIEF VETERINARY OFFICER FOR THE YEAR ENDING DECEMBER 31st, 1931

In reviewing the third annual report of Mr. Medlock, Chief Veterinary Officer for Surrey, one is at once impressed by the concise yet informative nature of its contents.

During the year 1931 the part-time Veterinary Officers have continued to deal with suspected outbreaks of notifiable disease amongst animals (with the exception of bovine tuberculosis), but it is noted that from December 31st, 1931, the County Veterinary Staff, consisting of the Chief Veterinary Officer and four Assistant Veterinary Officers, has taken over the whole of the veterinary services. In a county such as Surrey, with its well-organised and competent Veterinary Department, such a change was almost inevitable, and must lead to greater efficiency and uniformity in dealing with outbreaks of scheduled diseases. Fortunately the county appears to be singularly free from these. The report states that during 1931, 13 suspected cases of anthrax were reported, but on examination all proved to be negative. Similarly, two suspected outbreaks of foot-and-mouth disease were investigated, and it was found that such disease did not exist. Only two cases of parasitic (sarcoptic) mange occurred, against five cases in 1930, and 67 in 1921.

The incidence of swine fever remains practically unchanged, and during the whole year not a single case of sheep scab was reported. One hundred and thirty-one cattle were dealt with under the Tuberculosis Order, and of these 100 were detected during routine inspection of the dairy herds, a fact which speaks volumes for the benefits of systematic veterinary inspection.

The prevalence of Johne's disease and contagious abortion is mentioned by Mr. Medlock, who makes suitable suggestions regarding the diagnosis and control of the conditions.

The final and perhaps most interesting section of the Report, deals with the work done under the Milk and Dairies Act and Order, and one learns that the 1,100 registered cow keepers in Surrey, and their herds, have been visited four times during the year. Further, it is stated that these visits to, and examinations of herds were carried out without any administrative difficulties, and with the increasing confidence of the farmers. As far as the present writer is aware, there is no other county in England where quarterly examination of the dairy herds has been accomplished, and the fact that this has been done in Surrey reflects the greatest credit on Mr. Medlock and his staff, and indicates the infinite tact and courtesy which these officers must necessarily have exercised in the execution of their duties. Apart from the detection of disease, the educative value of these inspections cannot be over emphasised.

During the year 678 samples of milk were taken by the Veterinary Staff and submitted for microscopic and biological examination.

The number of positive individual samples was 53, and of these 33 were detected microscopically and 20 biologically after negative microscopic examination. One must venture some criticism at this point, as it is the present writer's experience that over 90 per cent. of positive individual milk samples should be comparatively easily detected by microscopic examination.

Unfortunately Mr. Medlock does not state where, or by whom, these examinations are carried out.

The report concludes with a list of producers of designated milks, and it is interesting and pleasing to note that the number of Certified and Grade A (T.T.) herds exceeds those producing the less reliable Grade A milk. Mr. Medlock's report depicts a year's work well and faithfully performed, and he and his staff are to be congratulated on the results they have achieved.

A. B. K.

LIVESTOCK IMPROVEMENT IN SCOTLAND

In the Annual Report of the Department of Agriculture for Scotland it is stated that an excellent response was forthcoming last year to the livestock improvement scheme in Scotland. The number of applications for premiums for bulls was greater than in any previous year, and the Department approved of applications from 367 societies and committees in respect of 662 bulls. The majority of these bulls were of the Aberdeen-Angus breed. This increased interest in livestock improvement augurs well for the Licensing of Bulls Act, which comes into force in Scotland very shortly.

* * * * *

The X-ray may be used to detect lead poisoning in children. Lead absorbed into the body is stored in the bones and may be detected as a dense band at the growing margin.

N.V.M.A. Divisional Reports

NORTH MIDLAND DIVISION.*

CLINICAL DISCUSSION AT SHEFFIELD

A meeting of this Division was held at the King's Head Hotel, Change Alley, Sheffield, May 10th, 1932, when there were present Messrs. R. Hudson (in the Chair), J. Abson, T. Bowett, W. Collinson, G. D. Coward, T. C. Fletcher, G. J. Furness, G. Green, E. Marrison, M. Robinson-Thompson, and F. C. Scott. Lieut.-Colonel P. J. Simpson, President of the N.V.M.A., was also present.

The minutes of the last meeting were taken as read.

Correspondence.—Arising out of correspondence, it was resolved that £1 1s. be sent to the National Horse Association of Great Britain and £2 2s. to the Victoria Benevolent Fund.

Free Treatment of Sick Animals of the Poor.—Lieut.-Colonel Simpson gave an outline of the work already done in some divisions where the voucher system had been adopted, and it was decided to await the reply from the R.S.P.C.A. before taking any further action.

The Hon. Secretary was authorised to pay outstanding accounts for 1931.

The Minutes of the Council Meeting were taken as read, on the motion of Mr. Scott, seconded by Mr. Collinson.

Mr. Collinson then addressed the meeting as follows:—

Our worthy Secretary suggested that instead of a set paper on any one subject, several members should start a discussion on anything of professional interest. I was one of those on whom he fixed and from whom he would not take a refusal. I hope you will forgive any shortcomings in these few notes on a few lines of treatment I have found successful, and trust that we may have a good discussion and that we may derive mutual benefit therefrom.

(1) *Intra-tracheal Injection of Formalin Solution.*—The strength used is 2 per cent. in doses of 10 to 20 c.c. One should take the precaution not to get any of the solution into the subcutaneous tissues, as this causes a lot of swelling and even suppuration. This can be avoided by inserting a dry needle into the trachea and injecting a little clean water after injecting and before withdrawing the needle. I will mention only one or two cases as examples. First, a blood mare and foal. The former had been sent away to foal and be served again before being returned home. They were sent home some time in October and both were suffering from a nasty nasal discharge. I was called in on October 29th and gave 3 c.c. mixed vaccine (Streptococcal and Staphylococcal) and 30 c.c. serum to the mare and half this dose to the foal. The above doses were repeated on December 8th, January 8th and 10th. I could not see the slightest improvement, so thought I would try the intra-tracheal injection of formalin solution, and on January 18th gave the mare 20 c.c. and the foal 10 c.c. On January 22nd there was great improvement and the above doses were repeated; both then cleared up and there was no further trouble.

I use the same injection in laryngitis with equally gratifying results. It is also useful in the early stages of pneumonia, in some cases bringing down the temperature very rapidly and permanently.

Another case I well remember was a hunter of my own, operated on for roaring by our worthy President. In about three days one could not bear the stench from the wound on entering his box. I gave him two injections of 20 c.c. on two consecutive days and there was no more smell, the wound healing in a very short time, and I think this had a lot to do with the operation being successful. The injection should be made fairly low down the neck. Animals cough after the injection and so diffuse the solution into larynx, nasal sinuses and nasal chamber. It is also sucked into the lungs on inspiratory effort after coughing.

My Colliery Cos. buy batches of ponies from the dealers and I found that when we had them a little while they would start with influenza and strangles, but one or two injections of formalin soon put them on the road to recovery. I now make a practice of injecting them as soon as we get them, and have no trouble with these outbreaks. The same applies in cases of influenza on farm premises; if I get a case I give the other horses a dose as a preventative with equally good results. These few notes may suggest other cases in which the injection may be useful.

(2) *Collosol Manganese* (*Intramuscular Injection*).—The manufacturers recommend this drug for suppurative processes, as a specific for coccigenic infections, and as worthy of trial in staphylococcal and streptococcic diseases. At present I have only used it in mastitis and am delighted with the results. The dose is from 7 to 10 c.c. at four day intervals. If called in the early stages two doses usually clear up the udder. In older-standing cases five or six doses may be necessary. Owners like it because it eliminates a lot of work in fomenting and rubbing in liniments, etc. All that is necessary is to strip the udder three or four times each day. In the worst cases I recommend fomenting with cold water and have one client who now applies the hosepipe as soon as he finds one infected and sends word for me to take my needle and inject. If caught early, there is no reason to expect loss of the quarter. In the worst cases the affected quarter dries up and atrophies, the animal milk-

*Received for publication May 31st.

ing normally on the other quarters. Animals improve quickly and soon begin to eat after an injection. I am now giving this injection in all cases of high temperature and have had some most satisfactory results.

(3) *Injection of Lugol's Solution of Iodine.*—For some years I have been using this injection in actinomycotic infections of the glands of the head and neck in cattle. The injection should be made in three or four places round the enlargements and well to the base. I use a 2-inch needle and inject 10 c.c. at each point—sometimes as much as 60 c.c. round one enlargement, if very big. This treatment has given excellent results even in very large tumours: most of them gradually waste away, a few suppurate and burst and so drain themselves clear. The animal should be very securely fastened as it resents the injection very much.

I have a case I should like to mention which is not on the agenda. *Subject,* heifer calved one week, straining badly, tremendously swollen behind and straining and bellowing out when I arrived. I had never given the intra-coccigeal injection, but thought I would try my luck in this case. I gave a solution of 4 grs. to the ounce, 5 c.c., and straining stopped almost immediately. I told the owner to let me know if she started again. He came in about three hours and said she was straining as badly as ever. This time I gave her 2 gr. quinine and urea hydrochlor. It was about half an hour before she stopped straining, but she did not start again and made an excellent recovery. I used this injection because it is much more prolonged in its action.

Mr. Scott said that he wished to thank Mr. Collinson for bringing some useful information of interest to the country practitioner. He had used colloidal manganese very extensively in mastitis and in many cases had found one injection sufficient. In the early stages he had almost invariably got degeneration abscesses about three months afterwards. He had found urea quinine to give very prolonged anæsthesia. He would like Mr. Collinson to say whether the treated tumours were deep-seated or superficial.

Mr. Marrison observed that he had had experience with Lugol's iodine, but not with formalin. He had recently been called to a stallion with high temperature but no pain. The stomach pump was employed and the next morning the animal was inclined to feed and was at work for two days when he was again taken ill—temperature 105°, pulse 80—he was then given 1 ounce aloes, 2 drs. formalin, and chloral. The next morning he was quite normal and has been so for a week.

Manganese Injections.—He had had several cases of abscess formation following injection. In one case the cow gave no trouble for 12 days and then developed mammitis in one quarter and a temperature of 105°. He immediately gave 5 c.c. in the gluteal region, which was full of gases. The cow died and on *post-mortem* the tissues appeared as in blackleg. He decided to change the site of injection to the muscles at the back of the thigh and in each case abscesses had formed, but the udders cleared up. The speaker then procured the finest possible needles and had had no trouble since. He found that the larger needle punched out a piece of skin and carried it into the site of injection; he was satisfied that this was the cause of the abscesses. He had used the injection in cases of retained placenta and in three cases at least had saved the animal.

Mr. Bowett said that he had used collosol manganese with success and had injected three calves for scour with 2 c.c. doses, with good results.

Mr. Green reported that he had given injections of cocaine on several occasions with good results, the effect lasting about two hours. He had sometimes injected Lugol's solution under the tongue in cases of actinomycosis, with occasional good results.

Mr. Furness thought that the injection of pit ponies immediately after purchase was a very good thing. He had tried collosol manganese during the last summer and in one case the cow had developed symptoms similar to blackleg: he thought Mr. Marrison's explanation about needles might be of value.

Mr. Hudson said he had tried collosol manganese in a number of cases and in one the animal had died. He wondered if there was any shock from the injection. He had found some cases where the injection had no effect; he was not in favour of it in acute cases, and in those where there were considerable milk changes with little or no inflammation of the udder he had seen no benefit from the injection. He considered it a pity that we did not know what organisms were working in mastitis and, therefore, had no guide as to treatment. He preferred injections in the muscles at the bend of the elbow to those in the hind quarter.

Mr. Scott remarked that Mr. Marrison and Mr. Furness had referred to blackleg-like swellings and that he had had two cases of cows where this occurred and death supervened, in which no injection had been given.

Mr. Fletcher said that the only thing that had struck him as useful was the injection of cocain in cases of excessive straining. As to the treatment of scour in calves, he might be inclined to try 2 c.c. injection.

Mr Collinson, in responding, said (in reply to Mr. Scott) that it was only necessary to get to the base of the tumour and the treatment should then be effective.

Mr. Marrison had been very unfortunate: he (Mr. Collinson) had as yet had no cases of abscesses with manganese injection. When cows had been lying and got septicæmia he thought Derbyshire limestone would be likely to cause

those sores. He had always given 10 c.c. manganese and had not experienced any case of shock, though in many cases the temperature was 105°. He had two or three cases of wooden tongue under treatment at the present time and thanked Mr. Green for his "tip" as to injection of Lugol's solution in the tongue.

An Undetermined Fatal Disease of Cats.—Mr. Fletcher opened a discussion on this subject, saying that this was a great nuisance, because "the animal is brought in, one does not know what is the matter with it or how to treat it and you know that it will die." This particular disease was said to be due to poison. An eight-months old Persian kitten was brought to him on the Saturday; it had had some patent food for breakfast and also some bacon. The owner went out and on returning found that the animal had been sick two or three times during the day. On Sunday morning it showed all the characteristic symptoms of those cases—absolute collapse—and when lifted gave a peculiar cry. A *post-mortem* was made, but without result. He would like to hear the experience of anyone who had met with cases of this kind. It had been suggested that it might be ptomaine poisoning, but in that particular case that was out of the question. Some investigations were required in respect of that disease, because a considerable number of cats were lost through it.

Mr. Thompson said that he had a somewhat similar case and had found a patchy inflammation of the stomach and bowel.

Mr. Scott observed that during the last two years he had known places where cats had died off in numbers and in one case, where investigations were made, bi-polar organisms were found. He thought the disease was feline typhus, and if investigations were carried out on those lines, that theory might be proved true; but death might supervene in the acute stage before there was time for lesions to develop.

Mr. Hudson had noticed that disease in country districts and had known it to sweep a village. He suggested that chloretone in small doses might be given with advantage.

Colonel Simpson said that, from his experience, he thought the condition was a form of typhus.

Mr. Scott remarked that in one case he had used pasteurella serum with success.

Mr. Scott then exhibited and explained the use of the Uterine Valise. This apparatus is for use in the return of an everted uterus. It consists of an open-ended valise, made of stout linen or similar washable material, provided with three removable canes and straps for constriction. It is wrapped round the uterus and constricted. The whole is then held against the body of the operator who, while exerting pressure against it, opens the vulva with his hands. The canes are withdrawn as the valise enters the vulva and when the organ is returned the valise is withdrawn.

Bovine Mastitis (other than Tuberculous or Actinomycotic)

Mr. G. Green, in introducing this subject for discussion, said:—

I do so, not with an idea of imparting anything new, but with the knowledge that this condition is of vital importance to stock breeders and dairymen and entails considerable financial loss, not only by reducing the value of the animal itself, but also from the great loss in milk sustained.

This disease is very prevalent in this district, as in all others, and occurs in winter as in summer (designated in the latter as "summer mastitis") and of course becomes of great importance to veterinary surgeons.

The cause of the disease is in most cases streptococcic, staphylococcic, or pyogenic infection, although other organisms may be associated with the condition. Invasion may be by way of the milk duct, although we know it is also carried in the blood and lymph streams, as from a septic condition of the uterus after parturition where there is retention of the placenta. In summer mastitis, flies are often the carriers.

Symptoms.—Its onset is sometimes very sudden; a cow bought in a market to-day is found next morning to have developed a mastitis. The affected quarter or quarters are swollen, intensely painful, respirations hurried, temperature up to 106°, appetite in abeyance; in fact, all the symptoms of an acute febrile condition are exhibited. In other cases the condition is more subacute, associated with less swelling, pain, and less febrile disturbance.

Predisposing causes are exposure to cold, as in the market, great fatigue; in fact, anything which has a tendency to lower the vitality of an animal with a highly vascular secretory organ like the udder.

Treatment.—My view is that very early treatment is of paramount importance. We want to subdue the initial inflammatory condition before it has time to pass on to the more serious and devastating phases, which are often suppuration followed by partial or total destruction of the glandular structure, which is squeezed out of existence as the result of inflammation and pressure of inflammatory products in the same way that liver cells are destroyed as the result of cirrhosis. The condition may even become septic and death intervene. With the object of limiting the action of the organism, I therefore immediately inject 30 c.c. of pyogenic serum, and in cases where there is hæmorrhage, I give an injection of adrenaline. Cold water applications to the udder, followed by astringent lotion—the old "white lotion" (zinc and lead) is very useful to reduce the congestion of the blood vessels which, in the acute form, are usually engorged. Undue massage in the early stages is, I think, contra-indicated. I have often found on

the following day that the condition has improved, temperature dropped; in fact, a general improvement in every way. Febrifuge medicine may then be administered. Personally, I give sod. salicylate in half-ounce doses two or three times daily. I have found collosol manganese useful after the very acute stages have passed and in septic forms of the disease, but I intend to give a more extensive trial to this agent. These cases are, I think, contagious and I would ask that the use of a common cloth to wipe and clean the teats and udders, in an endeavour to conform with the Milk and Dairies Order, be strongly deprecated. Cows with mastitis should be isolated and milked last of all. The affected quarter should also be milked last of the four. The milk should be destroyed and never milked on to the floor: I usually have it poured into a bucket containing a concentrated solution of some disinfectant.

Prevention.—Preventive inoculation is well worth practising. On a farm where mastitis seemed very prevalent, I vaccinated cows with "mixed infection mastitis bacterin" and not one became infected. I have, in fact, vaccinated a large number with good results. In summer I have found that smearing the udder and teats of dry "laying off" cows with creosote 3ss.-j. to 1 lb. of petroleum jelly, and repeating, very useful in preventing infection by flies. During the course of inspection of dairy cows one often comes across a light, small quarter and I think one might safely say that it has probably had a mastitis. I do not think that any case of mastitis, however good the recovery seems to be, leaves the whole of the tissue unimpaired. It is this damage, whether great or small, which causes such loss to our clients and which, of course, interests us as general practitioners.

William Tweed, *Hon. Secretary.*

ROYAL COUNTIES DIVISION.*

MEETING AT GUILDFORD

A meeting of Royal Counties Veterinary Medical Association was held at the Lion Hotel, Guildford, on April 29th, 1932, with the President (Major F. J. Taylor) in the Chair. Other members present were Mr. J. Bell, Captain R. E. C. Bullen, Captain J. A. Craft, Mr. P. Crosfield, Major A. C. Duncan, Major G. W. Dunkin, Major J. J. Dunlop, Mr. W. A. Hancock, Captain J. R. Hewer, Mr. C. W. Howard, Captain W. L. Little, Messrs. J. Willett and R. A. Willett, and H. Bell (Hon. Secretary).

The following attended as visitors: Miss P. M. Edmunds, Lieut.-Colonel H. Greenfield, Mr. E. R. Greenwood (R.V.C.), Misses M. N. Lane and M. V. Leir (R.V.C.), Mr. F. W. Medlock (C.V.O. Surrey C.C.), Mr. G. L. Peskett (Nat. Inst. for Research in Dairying, Shinfield).

*Received for publication May 31st.

The minutes of the previous meeting, having been published in the *Record*, were taken as read.

Apologies for Absence.—Letters of apology for absence were read from the following gentlemen:—Messrs. A. J. Baxter, J. R. Baxter, Captain H. B. Collet, Messrs. J. C. Coleman, C. H. Ducksbury, A. V. D. Franklin, Captain T. M. C. Hunt, Major Hamilton Kirk, Messrs. Tom and Harry Lepper, Mr. J. W. McIntosh, Mr. J. McKerlie, Mr. G. P. Male, Colonel P. J. Simpson, Captain S. Villar, Colonel G. K. Walker, Mr. F. W. Willett, Mr. Ernest Wilkinson, and Captain E. C. Winter.

Obituary.—The President said he had a very sad duty to perform in recalling the death of a very old member—Mr. Sydney Slocock—one whom they all knew and respected.

Mr. J. Willett observed that he had known Mr. Sydney Slocock practically all his life, and it was men like him whom the profession missed very much. He was always most earnest in professional matters and in helping a lame brother. He was, as many would remember, president of the Victoria Veterinary Benevolent Fund, and the work he did in connection with the latter very few realised, except those who sat with him. He was for many years a member of the Council of the Royal College of Veterinary Surgeons and had filled the Presidential Chair of that Council with distinction. Mr. Willett added that he was sure the Division had suffered a severe loss in the death of Mr. Slocock.

The members honoured Mr. Slocock's memory by standing in silence for a few moments.

Correspondence.—(1) From Major Slocock, thanking the Division for a letter of condolence sent to him at the time of his father's death. (2) From Mr. Howard, thanking the Division for a letter of sympathy and good wishes for a speedy recovery after a severe motor accident. (3) From the National Veterinary Medical Association, from the R.S.P.C.A., and from the Hertfordshire Branch of that body, all in connection with the organisation of the proposed free treatment scheme for sick animals of the poor.

After discussion, it was agreed to comply with the request made in the R.S.P.C.A. communication.

Nominations for Membership.—The following nominations were received:—Mr. B. G. Catmur, Abingdon (proposed by Colonel G. K. Walker, seconded by Mr. H. Bell), and Miss M. P. Edmunds, National Institute for Research in Dairying, Shinfield (proposed by Captain W. L. Little, seconded by Mr. Jack Willett).

Elections.—The following were elected to membership:—Lieut.-Colonel Greenfield (Camberley), Dr. A. L. Sheather (Chorley Wood), and Mr. H. C. Shingler (Banbury).

Royal Sanitary Institute Congress.—Major J. J. Dunlop was appointed as the Division's delegate to attend the Congress of the Royal Sanitary Institute.

MORBID SPECIMENS AND CASES OF INTEREST

Under this heading, Captain Little said he desired a little information. He wished to know whether in the Royal Counties area periodontal disease in horses was at all prevalent. He had met with it frequently in the Eastern Counties. He had been making enquiries there recently, and had been told it was getting less frequent, the reason given being that young horses were not wintered in straw yards, but mostly in pastures. In the old days they were put in straw yards and fed on hay and mangolds, and it might be that those animals were deficient in vitamins; if they were fed on corn at all it was on oats, and they were told that oats contained an anti-calcifying factor. He believed that the reason horses got periodontal disease was that they were not fed and cared for properly at the time they were cutting their teeth. Captain Little exhibited a molar, taken from an eight-year-old mare, showing the disease. Since the tooth had been extracted the animal had been much better. If there was a diseased molar on one side, there was nearly always one on the other.

Captain Hewer exhibited a fœtus of a calf. The mother, he said, was inoculated on August 13th, served on October 29th, and on December 27th the fœtus slipped from it. He also showed a piece of wood he had extracted from a horse's nostril. The animal had jumped a fence, and fell awkwardly, and the piece of wood had been forced up its nose.

Major Dunkin said that Mr. Hewer's fœtus exhibit was interesting, because the dam had been vaccinated with the "live" vaccine, but no expression of opinion had been offered as to the part, if any, that this had played in bringing about premature birth.

He suggested that a fruitful discussion would result, if one were tabled, on the comparative value of the "live" and "dead" vaccine.

Continuing, Major Dunkin recalled that Mr. F. T. Harvey read a very interesting paper on Periodontal Disease and he (Major Dunkin) believed he ascribed the cause of the disease to some form of bacterium. As far as the speaker recollected, Mr. Harvey did not suggest that it was due to improper feeding.

Captain Little said he disputed that. Mr. Harvey spoke about the upper molars, whereas the disease was usually met with in the lower molars.

Captain Hewer asked what forceps were used for the extraction.

Captain Little replied he did not think they could be bought; he had his made by a blacksmith. The best he had ever had were those of the late Mr. William Shipley, of Great Yarmouth.

The President commented that Thompson, of Sheffield, had some very good ones.

Captain Little observed that the difficulty in extracting molars affected with this disease was that the crown became soft, and the forceps were apt to slip off; the secret of success was to loosen the molar before trying to extract it.

Mr. Willett, commenting on the fœtus, said it was a very interesting specimen, especially having regard to the development, if two months.

Captain J. A. Craft did not think it was a two-months-old fœtus, but said it was more like a three-weeks-old one, retained in the uterus until expelled. He had seen a nine-days-old fœtus, and that was about the size of a new-born mouse.

Captain Hewer observed that he thought the dates he had given were correct.

Next Meeting.—On the President's suggestion, it was decided to hold the summer meeting at Whipsnade.

Captain Hewer drew attention to the fact that the Mid-West and South Wales Division were holding their summer meeting at the Dairy Research Institute, Reading, on July 1st, to which any member would be welcome. Particulars would be advertised in the *Veterinary Record*. If members could let him know if they intended coming it would facilitate arrangements.

Paper.—Captain W. L. Little now presented a paper entitled "Milk Fever or Hypocalcæmia of Parturient Cows," which was much appreciated by all present, and which evoked a good discussion.

[Captain Little's paper, and a report of the discussion, are reproduced earlier in this issue.—Ed., *Veterinary Record.*]

Votes of thanks for the essayist and to the President for his conduct in the Chair, brought a successful meeting to a close.

H. Bell, *Hon. Secretary.*

ROYAL SHOW ENTRIES

"It is not surprising that several national breeds have failed to send in enough entries to qualify for classification at the Royal Show this year," says the writer of "Farming Notes and Comments" in *The Times*. "The qualification set by the Royal Agricultural Society is that there should be at least four entries in each class and four different exhibitors of each breed represented at the show. Under this rule some of the North Country breeds, notably Galloway cattle, Leicester sheep, and Border Leicester sheep, and also Welsh cattle and Welsh Mountain sheep, will be excluded. Southampton is a long way from the Border country and Wales, and these breeders can be excused for defaulting in such difficult times. But it is disappointing to find that the Dorset Horn breed has failed to qualify for classes at the Royal Show. Many visitors to the show would have been interested to see this unique breed, which has come to the fore for the production of baby lamb for the Christmas and early spring market."

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The Duke of York has consented to accept the Presidency of the Highland and Agricultural Society for next year when the show will be held at Dundee.

Notes and News

DIARY OF EVENTS

June 20th.—Meeting of Finance and Editorial Committees, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, at 3.45 p.m. and 4.30 p.m. respectively.

June 22nd.—Meeting of West of Scotland Division, N.V.M.A., at Glasgow Veterinary College.

June 23rd.—Meeting of the Western Counties Division, N.V.M.A., at Plymouth.

June 27th.—N.V.M.A. Committee Meetings.

June 28th.—N.V.M.A. Council and Committee Meetings.

June 29th.—R.C.V.S. Committee Meetings begin.

June 30th.—R.C.V.S. Annual Dinner.

July 1st.—R.C.V.S. Council Meetings.

July 1st.—Summer Meeting of the Mid-West and South Wales Division, N.V.M.A., at Shinfield, Reading.

July 6th.—R.C.V.S. Summer Examinations begin.

Aug. 11th.—Royal (Dick) V.C. Alumnus Lunch at Folkestone.

Aug. 8th-13th.—N.V.M.A. Jubilee Congress at Folkestone.

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R.C.V.S. OBITUARY

Hume, Andrew. Haddington. Graduated New Edinburgh, April 16th, 1879. Died June 10th, 1932; aged 73 years.

Montgomery, R. Eustace. Graduated Edinburgh, May 20th, 1903; died June 11th, 1932.

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Obituary

DEATH OF MR. R. E. MONTGOMERY

We deeply regret to record the death of Mr. Robert Eustace Montgomery, M.R.C.V.S., Adviser on Animal Health to the Colonial Office, which took place in St. Thomas's Hospital on Saturday. The great loss thus sustained by the veterinary profession was as unexpected as it will be universally lamented, for although some concern was occasioned by Mr. Montgomery's palpably indifferent health since his return from his last Colonial tour (in the Autumn of 1931) it was hoped and believed that there was no occasion for alarm.

In the death of Mr. Montgomery the Association loses a valued member of long standing, who has not only been a staunch supporter, but who has actively participated in its working as an esteemed member of the Editorial Committee. To this committee his unrivalled knowledge of colonial veterinary administration has been of the utmost service, while his well-informed reviews of colonial service reports have been a widely-appreciated feature of this journal.

The son of Mr. Robert Montgomery, of Manchester, he was a student at the Royal Veterinary College, Edinburgh, and was appointed demonstrator of comparative pathology in the University of Liverpool in 1903. In 1904 he became assistant Imperial bacteriologist to the Government of India, and in 1905 he was in Canada on special duty. In 1907-9 he was a member of the sleeping sickness expedition of the Liverpool School of Tropical Medicine to Central Africa, and from 1909 to 1917 he was veterinary pathologist of the East Africa Protectorate. He was then appointed director of veterinary research to the Union of South Africa, and from 1920 to 1926 he was veterinary adviser to the Governments of Uganda, Kenya, and Tanganyika. In the War he was commissioned as major of the East African Veterinary Corps, and was mentioned in dispatches and received the 1914-15 medal and the Order of the Brilliant Star of Zanzibar.

Mr. Montgomery visited the Sudan, Egypt, Argentina, Uruguay and Brazil, in his researches into animal diseases and the utilisation of livestock and their products from Colonial sources. He was chairman of the Pan-African Veterinary Conference at Nairobi, in 1923. In June, 1930, it was announced that the Secretary of State for the Colonies had selected Mr. Montgomery for the appointment of Adviser on Animal Health, a new post, the creation of which had been recommended by the committee on the organisation of the Colonial veterinary services. Mr. Montgomery was formerly co-editor of the *Journal of Tropical Veterinary Science,* Calcutta, and had published more than 30 reports and papers in scientific periodicals, chiefly on the tropical diseases of animals in India and Central and East Africa, especially trypanosomiases. He married in 1914 Beatrice Louise, daughter of Mr. Frank Lloyd, of Wrexham, and had three sons.

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R.C.V.S. ANNUAL DINNER, JUNE 30th, 1932.

As has already been announced, H.R.H. The Duke of Gloucester will be the guest of honour at the Annual Dinner of the College on June 30th. There will also be present Earl De La Warr, (Parliamentary Secretary to the Ministry of Agriculture), Lord Dorchester, Lord Askwith, K.C.B., K.C., D.C.L. (President, National Greyhound Racing Society, and Past President, British Science Guild), Lord Richard Cavendish, P.C., C.B., C.M.G. (Chairman, Agricultural Research Council), Sir Merrik Burrell, Bart. (Chairman, Diseases of Animals Committee of Agricultural Research Council), Major R. T. Stanyforth, M.V.O., M.C. (Comptroller to H.R.H. The Duke of Gloucester), Mr. S. R. Whitley, Captain Hilton Green, Professor W. N. Jameson, M.A., M.D., D.P.H. (Dean of the London School of Hygiene and Tropical Medicine), Mr. J. F. Elias (Managing Director, Odham's Press), Mr. Colin Smith, M.V.O., O.B.E. (Deputy Clerk of the Privy Council), Mr. E. G. S. Machtig, O.B.E. (Assistant Secretary, Dominions Office), and several others.

Early application should be made for Dinner Tickets to the Secretary, R.C.V.S., 10, Red Lion Square, W.C.1. The price is 15s. exclusive of wines.

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N.V.M.A. CLINICAL PRIZE SCHEME FOR STUDENTS

With the approach of the Long Vacation we desire to draw the particular attention of our student readers to the above scheme, in the hope that the increased degree of interest exhibited in last year's contest may be exceeded in connection with the 1932 competition. Full particulars will be found posted on the notice boards of the respective colleges.

Promoted as an incentive to students to acquire the invaluable art of efficient case-recording, the scheme—as former entrants have revealed to us—is of immense service to participants in developing the habit of recording and classifying the essential features of interesting cases met with under the ordinary conditions of practice. Such well-spent endeavour cannot fail to yield a good return in the examination room.

PERSONAL

Major D. S. Rabagliati, O.B.E., B.SC., F.R.C.V.S., D.V.S.M., Chief Veterinary Officer for the West Riding of Yorkshire, has been appointed by the Society of Medical Officers of Health as one of their delegates to meet a Sub-Committee of the Association of Municipal Corporations to consider the Milk (Special Designations) Order, 1923.

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Mr. F. W. Emery, F.R.C.V.S., Chief Veterinary Officer to the Ministry of Agriculture, Northern Ireland, who, as recorded in our last issue, has been made an Officer of the Civil Division of the Order of the British Empire, graduated from the Royal Veterinary College, London, in 1889, and in the same year became veterinary inspector to the Privy Council. He was promoted to supervisory rank eight years later. In 1900 he was appointed supervisor of Portal Veterinary Inspection at Belfast, under the Department of Agriculture and Technical Instruction, and in 1922 became Chief Veterinary Officer to the Imperial Secretary Department (Northern Ireland) of the British Home Office. Mr. Emery received his present appointment in 1926.

For two years in succession he has been elected President of the North of Ireland Veterinary Medical Association, and for twelve successive years was President of the Veterinary Officers' Association for Ireland.

In 1914, and again in 1930, Mr. Emery was a member of the organising committee of the International Veterinary Congress, London. He is a member of the Royal Institute of Public Health, and was a member of the Public Health and Poor Law Commission, Northern Ireland, 1924-27.

. . . . .

The *Ayr Advertiser* states that, on special request, Mr. W. Gardner, M.R.C.V.S., Maybole, officiated as demonstrator on the Clydesdale horses to the students of the West of Scotland Agricultural College at Barassie, Troon, recently.

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THE INSTITUTE OF THE HORSE

The sixth annual general meeting of the Institute of the Horse was held on June 7th, with Lieut.-Colonel H. E. Norton in the chair. The accounts and secretary's report for the year ended March 31st, 1932, were approved, and Mr. Stanley Palmer was re-elected honorary auditor for the ensuing year. At a council meeting which preceded the meeting it was unanimously agreed that steps should be taken to oppose a Bill in Parliament for authority to close Bushey and Richmond Parks to riders after 12 noon. It was decided that such a step would be a great inconvenience to all who are accustomed to ride in these parks and a cause of loss to those who are interested in hiring horses to the public. At an extraordinary general meeting which followed the general meeting the following special resolutions were passed:—1. That the name of the institute be changed to the Institute of the Horse and Pony Club, Limited. 2. That the articles of association be altered to meet the requirements of the newly-constituted body. A new council has been formed under the chairmanship of Major V. D. S. Williams, which included stronger representation of the Pony Club.

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MINISTRY'S DISPLAY AT THE "BATH AND WEST"

"Nothing like the display staged in the Ministry of Agriculture's pavilion has been seen at any show in this country," says *Pulman's Weekly News* (Yeovil) in its account of the Bath and West Show. "It is a revival, on a bigger scale and with unique features, of those which the Ministry provided at shows some years ago. A section devoted to animal physiology shows by a remarkable collection of photographs and specimens preserved in spirit the latest developments in the study of sterility in cattle, and indicates how certain forms of this can now be cured by a veterinary operation. Prepared by the Ministry's veterinary laboratory in collaboration with the School of Agriculture of Cambridge University, it includes a photograph of the earliest stage of the development of the embryo which has ever been seen.

"An exhibit of special interest in Somerset and Dorset, where milk recording methods are so enthusiastically adopted by modern dairy farmers, is that showing the gains effected by recording methods. In 1925 the average yield of a very large number of cows was 416 gallons. By 1930 the average yield of 71,432 milk-recorded cows was 711 gallons. Milk recording, it is urged, is the key to success in the dairying industry. Some 60 per cent. of the dairy farmer's cattle are sold because for one reason or another, they are not efficient units in his industry.

"The Royal (Dick) Veterinary College, Edinburgh, has collaborated in a section on diseases in poultry. Models and stuffed specimens show the causes, effects, and means of control of gape in chicken. No less instructive is a similar display dealing with fowl pox, to prevent which a vaccine prepared from pigeons infected with pigeon pox is now very successfuly applied. Specimens showing the progress of tuberculosis in birds also demonstrate that there is no organ immune from the attack of the disease."

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

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DENTAL ANÆSTHESIA IN THE DOG

To the Editor of the Veterinary Record.

Sir,—One read with great interest the article "Dental Anæsthesia in the Dog," by Mr. J. T. Edwards, M.R.C.V.S., in the *Record* of May 21st, in which he describes perineural infiltration of the infraorbital and inferior alveolar nerves by the injection of a local anæsthetic solution into the respective foramina through which they emerge.

We have long recognised that adequate and satisfactory anæsthesia in canine dental surgery is one of the most difficult problems we have to encounter, and I am disappointed that Mr. Edwards did not give us considerably more detail as to the technique he adopts in inducing this type of anæsthesia in dogs suffering from extensive dental disease.

The commonest condition we encounter which entails the extraction of a large number of a dog's teeth, is an extensive septic alveolitis, associated with pyorrhœa and large accumulations of dental tartar.

The disease is particularly common in dogs of the Pomeranian type and is usually associated with considerable pain. As a general rule, morphinisation is necessary before an examination of the mouth can be made, but such narcosis is often quite inadequate for the extraction of teeth; in

fact, a little interference is sufficient to send the animal frantic.

Mr. Edwards describes the operation as being carried out with surgical asepsis. In the mouths to which I refer, sterilisation is an impossibility. I feel that satisfactorily to introduce a needle having an internal diameter of 0·5-1 mm. (which can hardly be described as "a fine needle") into the foramina of the head would necessitate, in many of our cases, preliminary general anæsthetisation.

In the Poor Out-Patients' Department of the Royal Veterinary College, we meet a large number of these cases, and, as I have previously mentioned, the question of satisfactory anæsthesia is one to which we have given some thought. Chloroform or ether by inhalation have a number of serious drawbacks. A mask over the nostrils greatly interferes with one's work. If administration is stopped at the onset of operation, consciousness is often returning before the operation is completed. Whereas if one pushes the anæsthetic and the swallow reflex is lost, there is a danger of blood (bleeding being copious in these cases), pieces of tartar, or even teeth, being inhaled. Again, in the old dogs, and particularly those of the toy breeds, in which dental disease is met, there is frequently co-existing disease of the heart and kidneys, which increases the danger associated with the frenzy which may accompany even an examination, let alone chloroform.

Recently we have been using "Nembutal" (Na. Ethyl Methyl Butyl Barbiturate) in these cases, and have found the drug fairly satisfactory. The dose adopted varies from 1-5th to 1-10th of a grain per 1 lb. bodyweight, according to the age and condition of the patient. The drug is administered in a capsule by the mouth, on an empty stomach. In many cases we have had adequate anæsthesia, reflexes still being present. I do not suggest that anæsthesia has been invariable: in some cases we have had to augment the narcosis by light chloroformisation.

The following case will serve to illustrate some of my points:—

> Quite recently a Yorkshire terrier bitch was presented to us suffering from extensive septic alveolitis, with accumulations of tartar. The mouth was extremely fœtid. The animal weighed 7 pounds, was 14 years old, and was suffering from advanced mitral disease. The bitch became frenzied at the slightest interference with the mouth. It would have been quite an impossibility to have adopted regional anæsthesia; in fact, one was considerably taxed as to the best way in which to tackle the problem.
>
> "Nembutal," Grs. 1-10th per lb. bodyweight was given *per os* (¾ grain being used.) In fifteen minutes a profound narcosis was present, and ten teeth, nine molars and one canine were painlessly extracted. Recovery was uneventful, narcosis persisting for about six hours.

Dental disease is as common in the cat as it is in the dog, and here one's difficulties are even greater. Our invariable practice is to provoke Avertin narcosis (0·2 to 0·3 c.c. per kilogramme bodyweight) before attempting to interfere with the mouth.

There are only a very few conditions which necessitate interference with sound teeth. One, however, is common: this is extraction of the upper carnassial for the drainage of an infected antrum. Preliminary morphinisation will depend upon the temperament of the patient. Satisfactory local anæsthesia can always be obtained by infiltration of the gums, using a good dental syringe, provided this is carried out systematically and carefully. The operation requires considerable muscular effort on the part of the operator, but is quite painless for the patient.

Yours faithfully,

J. G. Wright.

Royal Veterinary College,
Camden Town, N.W.1.
June 11th, 1932.

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To the Editor of the Veterinary Record.

Sir,—I wish to thank Mr. J. T. Edwards for his reply to my communication on the above. Space will not permit me in these columns to reply in full to his letter, but the answer to the trend of his letter will be found in Sir Norman Bennett's well-known work on "The Science and Practice of Dental Surgery" (Oxford Medical Publications) Volume 2, pages 1302-1330. The perusal of this work will be of benefit to all those interested in this subject.

Supraperiosteal anæsthesia *if correctly* applied, is in fact a block injection; it should block the pulpal nerve fibres before they enter the apical foramen of the tooth. This can be achieved only if the anæsthetic solution is deposited at the apex of the tooth in the upper jaw and at the apices of the lower anterior teeth. Unless this important detail is carefully observed, the solution will not come in contact with the nerve supply and effect profound anæsthesia *before* the nerves enter the apical foramen of the tooth. The puncture point for all supraperiosteal injections is *in the muco-buccal fold, i.e.*, Posner's line.

I must emphatically disagree with Mr. Edwards when he states that there is "no great necessity for the use of a dental syringe for injections into the infraorbital canal or around the mandibular foramen." I am prepared to admit that it can be carried out with a Record syringe and an ordinary Record type of needle; in fact, I used to use these (until I secured one of Dr. Raison's syringes with fine Cottrell needles), but I am convinced that a dental syringe is by far the best. To start with you can inject under pressure and with a fine dental needle the puncture made is so slight, that there is little or any risk of undue escape of the injection. In the case of the horse, for nerve blocking by injecting into the infraorbital canal, especially in the larger breeds, a Record syringe and needle might be more suitable for some operators.

A very well illustrated booklet on nerve blocking is published, by the Antidolor Manufacturing Co., of Springville, Erie Co. New York, U.S.A., under the title of *Infiltration and Nerve Blocking*, by Dr. Waite, whose local anæsthetic is so well known to many. Although this deals solely with human dentistry, it will be found that the methods employed are applicable, modified where and when necessary, to our patients, especially the dog. The so-called "pencil grip" of the syringe when making the injection is illustrated, and its rotation when *in situ* is lucidly shown.

A very full and well illustrated treatise on Supraperiosteal anæsthesia appears in a recent number of *The Dental Magazine and Oral Topics*.

Yours faithfully,

1, St. Cross Road, Winchester. J. F. D. Tutt.

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TUMOURS ON THE MEMBRANA NICTITANS

To the Editor of the Veterinary Record.

Sir,—At the Annual General Meeting of the Lancashire Division, N.V.M.A. (reported in your issue of May 21st), the question of cancerous

growths on the membrana nictitans of horses was raised by Mr. Mayall. I have examined several tumours from this situation all of which were considered to be papillomatous in nature. Over two years ago I was asked to report on a small tumour which a colleague removed from the membrana nictitans of a cart horse, where it was producing intense irritation. The specimen proved to be an interesting one and showed the presence of well marked cell nests, which are characteristics of carcinomata, but as there was no infiltration of the subjacent tissues, it was, in my opinion, a very actively growing squamous papilloma.

Previous experience of tumours in this region had made my colleague very suspicious of cancer, so I qualified my diagnosis by stating that the growth might indicate a pre-cancerous condition, and it was decided to keep the horse under observation. My friend has now written to say that although this horse, now nine years, is slightly wall-eyed, there has been no further trouble and no recurrence of the tumour. With carcinomata, on the other hand, I understand that surgical interference usually stimulates them to more rapid development and to metastases.

Yours faithfully,
W. Lyle Stewart.

Armstrong College,
Newcastle-upon-Tyne.
June 8th, 1932.

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IODINE FOR POULTRY

To the Editor of the Veterinary Record.

Sir,—I note in your issue of June 4th that Mr. Lyle Stewart has replied to my letter on the above subject which you were good enough to publish on May 14th.

If I conveyed to any reader the impression that in his review of Professor Schmidt's lecture, Mr. Stewart had made no reference to dosage, this was certainly unintentional. It was the fact that Mr. Stewart failed to refer to Professor Schmidt's qualifications of his results, obtained with large doses, that inspired my mild criticism.

Professor Schmidt expressly points out that his results are at variance with those of other experimenters and attributes this to the difference between doses employed. He adds that further experiments with smaller doses must be made in order to ascertain optimum quantities.

Quoting my translation of Professor Schmidt's conclusions:—

"Whether it is possible by iodine feeding to derive the advantages published (increase in appetite, increase in growth, etc.) we were unable to prove in our experiments; as a matter of fact, the contrary was ascertained in some cases. However, as we worked with large doses which in the case of very powerful preparations not infrequently produce the opposite effects of the smaller and smallest doses, no objections can be raised against the aforementioned advantages of feeding iodine until and unless they are actually justified by a new series of exhaustive and thorough experiments." I submit that these words convey a very different meaning from those contained in the last sentence but one of Mr. Stewart's review. Further, they form a suitable reply to the charge of irrelevance levelled at me for referring to the use of small doses of potassium iodide for poultry and almost accuse Mr. Stewart of negligence in reading Professor Schmidt's paper, no insignificant portion of which is devoted to discussion of the importance of dosage.

That Mr. Stewart's review was misleading is to some extent confirmed by the fact that the Editor of one poultry journal has printed it in full in support of his view that no advantage can be obtained by adding iodine to the ordinary food of poultry. Such a view is not endorsed by Professor Schmidt, who retains an open mind on the subject.

Yours faithfully,
Frank Ewart Corrie.

Pelham,
Talbot Road,
Lingfield.
June 7th, 1932.

Diseases of Animals Acts, 1894 to 1927

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 31st May, 1932	23	27	—	—	5	7	2	94	41
Corresponding period in 1931	17	18	—	—	3	5	5	129	51
1930	11	12	—	—	10	11	5	130	32
1929	26	33	—	—	3	6	19	155	82
Total 1st January to 31st May, 1932	204	259	3	227	71	124	126	907	418
Corresponding period in 1931	248	266	5	515	77	129	169	811	333
1930	198	211	—	—	134	200	249	1,170	444
1929	214	243	20	1,804	129	258	320	730	381